

GOVERNMENT OF THE  
GOLD COAST.

---

MEDICAL AND SANITARY REPORT  
FOR THE YEAR  
1918.

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# GOLD COAST.

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## ANNUAL REPORT FOR THE YEAR ENDING DECEMBER 31ST, 1918.

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### I.—ADMINISTRATIVE.

#### 1.—MEDICAL STAFF ON 31ST DECEMBER, 1918.

- 1 Principal Medical Officer.
- 1 Deputy Principal Medical Officer.
- 1 Senior Sanitary Officer.
- 2 Provincial Medical Officers.
- 6 Senior Medical Officers.
- 3 Junior Sanitary Officers.
- 1 Pathologist.
- 38 Medical Officers, 4 of whom are Medical Officers of Health.
  - 15 Vacancies { 1 Sleeping Sickness Medical Officer.
  - 11 Medical Officers.
  - 2 Native Medical Officers.
  - 1 Medical Officer of Health.
- 1 Inspector Chemist.
- 5 Superintending Sanitary Inspectors (1 vacancy).

#### EUROPEAN NURSING STAFF.

- 3 Senior Nursing Sisters.
- 6 Nursing Sisters.
- 1 Nursing Sister seconded to Lome.

#### PRINCIPAL MEMBERS OF SUBORDINATE STAFF.

- 1 Chief Clerk.
- 1 First Class Clerk.
- 4 Second Class Clerks.
- 8 Third Class Clerks.
- 3 Temporary Clerks.
- 1 Messenger.

#### DISPENSING STAFF.

- 1 Chief Dispenser.
- 4 First Class Dispensers.
- 12 Second Class Dispensers.
- 11 Third Class Dispensers.
- 1 Laboratory Assistant.

## NATIVE NURSES.

- 6 Second Class Nurses.  
26 Third Class Nurses.  
32 Nurses.

## LUNATIC ASYLUM.

- 1 Chief Attendant.  
1 Assistant Attendant.  
10 Attendants.  
1 Matron.  
1 Gatekeeper.

## PRINCIPAL MEMBERS OF SUBORDINATE STAFF OF THE SANITATION BRANCH.

- 1 First Class Clerk.  
2 Second Class Clerks.  
3 Third Class Clerks.  
1 Messenger.  
3 First Class Sanitary Inspectors.  
10 Second Class Sanitary Inspectors (1 vacancy).  
31 Third Class Sanitary Inspectors (4 vacancies).  
1 Female Sanitary Inspector (1 vacancy).  
1 Disinfecto Mechanic.  
1 Storekeeper.  
8 Attendants for Contagious Diseases Hospitals.  
4 Vaccinators (1 vacancy).  
1 Third Class Clerk to Deputy Registrars of Deaths  
2 Clerks to Deputy Registrars of Deaths [(1 vacancy).  
18 Sextons.  
2 Messengers.

## 2.—FINANCIAL.

## (a) STATEMENT OF REVENUE FOR THE YEAR 1918.

Revenue (Hospital fees)	£2,197 19 8
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## (b) STATEMENT OF EXPENDITURE FOR THE YEAR 1918.

## Medical Department (including Sanitary Branch)—

Personal Emoluments	...	...	...	£49,972	18	1
Other Charges	...	...	...	65,526	1	9
Total	...	...	...	£115,498	19	10

## III.—PUBLIC HEALTH.

### (a) GENERAL REMARKS.

3. The following table shews the most noteworthy contrasts in the returns of diseases treated during the years 1916, 1917 and 1918 :—

			1916.	1917.	1918.
Small-pox ...	...	...	4	25	5
Chicken-pox ...	...	...	306	341	582
Dysentery { Amœbic ...	...	...	9	9	16
Type undiagnosed	...	...	527	510	400
Enteric Fever ...	...	...	6	10	6
Influenza ...	...	...	27	280	7,756
Malaria—Tertian ...	...	...	837	508	825
Quartan ...	...	...	28	25	84
Aestivo-autumnal ...	...	...	595	1,686	354
Chronic ...	...	...	80	168	67
Blackwater ...	...	...	16	24	17
Fever unclassified ...	...	...	2,052	1,096	1,834
Measles ...	...	...	91	82	80
Pneumonia ...	...	...	351	236	356
Rheumatic Fever ...	...	...	51	17	9
Sleeping Sickness ...	...	...	8	13	10
Whooping Cough ...	...	...	161	262	120
Alcoholism ...	...	...	36	17	25
Yellow Fever ...	...	...	6	5	3
Tuberculosis ...	...	...	283	261	239
Plague ...	...	...	—	6	—

4. The *Dysentery* returns shew a slight decrease as compared with the previous year, although out of 416 cases no less than 400 are classified as “Type undiagnosed.”

5. *Malaria*.—As will be seen from the chart accompanying the Pathologist’s Report the incidence of the disease closely followed the rainfall, which fell considerably short of that of the previous year.

3,181 cases of *Malaria* were treated as compared with 3,505 in 1917; whilst there were 17 cases of Blackwater fever with 4 deaths.

6. Four cases of *Yellow Fever* were notified—two Europeans and two natives—one of the former proved fatal, the others recovered. Two cases suspicious of *Yellow Fever* were reported in natives, one of whom died.

7. *Tuberculosis*.—The number of cases seeking treatment was 239 as compared with 261 in the previous year. This subject is more fully dealt with by the Senior Sanitary Officer in Part III. of this Report.

8. *Guinea-worm*.—Only four cases of this disease were treated in Accra as compared with 39 in 1917, 79 in 1916, and 123 in 1915. The progressive decline in the incidence of the disease is an obvious result of the introduction of the pipe-borne water supply.

9. *Influenza*.—The following are some extracts from reports sent in from various stations on the *Influenza* epidemic.

### KOFORIDUA.

First case a school-girl from Accra, who arrived in Koforidua with the disease on the 19th September; her brother, living in the same house, was stricken down on the next day.

By the time ten days had elapsed the town presented a changed appearance, places of business were closed and the market was more or less deserted.

The streets were silent and empty and trade was at a standstill.

Funeral processions were a common sight and the greatest depression prevailed.

The epidemic had reached its height and nearly disappeared within five weeks of the appearance of the first case.

*Symptoms.*—The incubation period was short and in some cases apparently less than 24 hours.

The onset was rapid and the victims were prostrated early.

Slight catarrhal symptoms were seen early, there was slight injection of the conjunctivæ and fauces with a little nasal discharge.

The temperatures ranged from 102°–103° or higher.

A dry cough was often present as an early symptom.

Later on cough was almost universally present, and thick purulent sputum was profuse.

In favourable cases the symptoms began to abate in four to six days.

Convalescence was, relatively speaking, long, and patients were often left weak and debilitated out of all proportion to the length and severity of their illness.

In unfavourable cases restlessness was often a marked sign, bronchitis was the commonest complication and pneumonia the next and most fatal.

It is a fact that quite a number, mostly children, have been brought to the Dispensary with albuminuria and dropsy with a very definite history of having suffered more or less severely from the disease.

Diarrhoea sometimes occurred as a late symptom and was in one or two cases very profuse and caused death.

*Nervous symptoms.*—Meningitis followed by loss of memory was present in one case.

Deafness was complained of in two cases; in one it was due to blocking of the eustachian tube and in the other apparently was some nerve deafness.

The heart muscles seemed particularly affected, and dilated hearts were not uncommon.

Of 26 Europeans in the district nine were attacked.

#### AXIM.

A crew of infected boat-boys arrived from Secondee on the 25th September. From the 27th September to the 2nd October the infection scattered slowly, from the 3rd–7th October it spread with great rapidity and was epidemic by the 8th of the month and continued at its height until the 25th. All work and movement in the town came to a standstill, and probably about 80 per cent. of the population was attacked.

From the 25th to the 31st October, a decline in the number of new cases could be noticed, and during the first week in November few new infections occurred.

From about the 9th to the 22nd November, the old cases were either recovering or dying, and the last death was recorded on the 22nd November.

Earlier cases 3 or 5 days type, later in the outbreak cases of 10, 12, 14 and more days fever were not uncommon.

*Varieties.*—Respiratory, common.

Intestinal, comparatively rare.

Nervous with meningitis and peripheral neuritis.

Estimated population ... ... 2,500.

Estimated cases ... ... 2,100.

Estimated deaths ... .. 140.

Death rate (per cent. of population) 5·6 per cent.

Case-mortality ... ... 6·6 per cent.

#### TARKWA.

Symptoms very similar to those of the Influenza epidemic in Great Britain in the nineties. Pains in the head, eyes and back and body generally. Coryza and catarrhal symptoms were common and severe diarrhoea was not infrequent.

*Complications:*—Pneumonia, bronchitis, meningeal symptoms, severe diarrhoea, conjunctivitis, otitis, ophthalmoplegia.

Cases, 3,417; deaths, 212; case-mortality, 6·2 per cent.

Native officials 66, attacked 23, deaths 4 = 17.3 per cent.  
 Police 57, 15 attacked, 4 deaths = 26.6 per cent.  
 It removed most of the phthisical cases.

#### SALTPOND.

First case 21st September, epidemic reaching its height in the 1st week of October.  
 Whole native Medical staff down with the disease.  
 All the cases of respiratory type and death in the fatal cases was due to Pneumonia, with the exception of one case of Meningitis.

For a period of nearly a fortnight, Saltpond was like a deserted city, shops were closed, the streets and markets practically empty.

40 per cent. of the population infected, the great majority being children and young people up to 30 years of age.

In a population of 4,000 during the months of September, October and November 163 deaths occurred from Influenza.

Of 128 cases treated at the Dispensary 13 died = 10 per cent.

Of 27 native officials, 22 were attacked and 3 died = 13.1 per cent.

Of 30 prisoners, 23 had Influenza. They were put in blankets in a large cell, given a mild diaphoretic and expectorant mixture, and all recovered.

#### SECONDEE.

The first cases were landed from ships on the 5th September.

The disease did not spread very much into the native town until the 18th; it attained its maximum virulence about the end of the month, and slowly died away during the months of October and November.

The first marked cases amongst Europeans occurred on the 22nd of September.

*Symptoms.*—Rapid onset, high temperature ( $103^{\circ}$ ), and bronchial symptoms.

*Varieties.*—Almost entirely of a respiratory type.

*Complications.*—(1) Europeans:—Bronchitis, Pneumonia, Pericarditis and temporary Mania.

(2) Natives:—Pneumonia, Bronchitis, Pleurisy and Endocarditis.

Estimated number of cases 8,000.

Estimated number of cases treated and number of deaths amongst same indicated in tables below:—

#### OFFICIALS.

		No. Resident.	No. Treated.	Deaths amongst Treated.
Europeans	...	73	22	Nil.
Natives	...	330	209	7 = 3.34 per cent.

#### NON-OFFICIALS.

		No. Resident.	No. Treated.	Deaths amongst Treated.
Europeans	...	52	21	Nil.

#### PRISONERS.

No. of Prisoners.	No. Attacked.	No. of Deaths.	
358	169	5	2.9 per cent.

## POLICE.

No. of Police.	No. Attacked.	No. of Deaths.	
76	30	4	13·3 per cent.

The Medical Officer of Health, Seceondee, estimates the mortality rate amongst the native population to have been about 4·55 per eent.

## WINNEBAH.

First case on the 24th September, a boat boy from Accra; the first ease in a resident was seen on the 25th. The last ease was reported on the 18th October.

*Onset.*—Headache, sore throat, pain in the eyes, eiliary, congestion, pain in the back, general malaise.

*Complications.*—Bronchitis, Pneumonia, Otorrhœa, Synovitis, Iritis, Empyema.

Total deaths 188.

Case-mortality of those treated 7·36 per eent.

14 cases amongst Europeans with one death=7·1 per eent.

Native officials.—Number of cases 25, 3 deaths=12 per cent.

Prisoners.—5 cases, no deaths.

## CAPE COAST.

The S.S. "Shonga" arrived in Cape Coast Roads on the 31st August. Two native passengers landing at Cape Coast were detained until examined, but shewed no symptoms of Influenza.

On the 17th September a female Post Office Telegraphist attended at the Dispensary with symptoms of Influenza which became epidemic on that date. It was subsequently ascertained that the Mail Officer who boarded the "Shonga" had complained of feeling unwell but did not report sick.

*Symptomatology.*—The earliest symptoms in nearly all cases were frontal headache, some nasal catarrh and general malaise, followed by a certain amount of bronchitis, and a broncho-pneumonia type of pneumonia.

There were 6 deaths among 115 out-patients treated, shewing a death-rate of 5·83 per cent.

## ASHANTI.

## COOMASSIE.

First ease 23rd September, 1918, and the epidemic was at its height by the first week in October.

Out of a European population of 105, 42 persons were attacked and there were 2 deaths, a case-mortality of 4·73 per cent.

Out of 762 native Non-Commissioned Officers and men of the Gold Coast Regiment 267 were attacked and there were 25 deaths, a case-mortality of 9·36 per cent.

Out of 75 Police 50 were attacked and 5 died, a case-mortality of 10 per cent.

Out of 183 native officials 70 were attacked, with 5 deaths=7·14 per cent.

Out of 27 cases amongst the Syrian population there were 5 deaths, a case-mortality of 18·51 per cent.

The whole of the prisoners, 164 in number, were attacked, and 8 died of the disease, a case-mortality of 4·87 per cent.

Adult males between the ages of 20 and 35 appear to have suffered most severely.

## OBUASI.

First ease on the 1st October, and the disease was epidemic by the 7th of the month.

Out of 71 Europeans 13 contracted the disease, and there were 4 deaths, a case-mortality of 30·76 per cent.

Out of 32 native officials 16 were attacked and there was one death, a case-mortality of 6·25 per cent.

The Chief Commissioner estimates that out of a total population of 450,000 in Ashanti there were 9,000 deaths or 2 per eent. of the population.

## THE NORTHERN TERRITORIES.

Disease reported at Yegi on the 8th October.

The first case occurred at Tamale on the 12th November, and the outbreak was pronounced by the 15th.

The distance from Yegi to Tamale is about 100 miles, and the disease travelled this distance in a little over a month.

In Tamale 598 cases were treated.

Amongst 750 recruits, 365 cases occurred and 22 deaths took place, a case-mortality of 6·02 per cent.

Out of 45 Constabulary attacked 2 deaths occurred, a case-mortality of 4·4 per cent.

Out of 38 prisoners attacked 2 deaths occurred, a case mortality of 5·3 per cent.

## NORTH-EASTERN PROVINCE.

The disease appeared in Gambaga about the middle of October and in Zouaragu about the 3rd week of November.

The infection came up the Tamale and Kintampo roads and from the French country in the North.

It is estimated that about 80 per cent. of the population were attacked, about 4,000 deaths occurring with a case-mortality of 5 per cent.

## NORTH-WESTERN PROVINCE.

The disease appeared in Wa on the 7th November and soon spread over the whole Province.

It was estimated that about 80 per cent. of the population of the province, 116,000, contracted the disease, and that 8,172 deaths resulted, which gives a case mortality of 8·8 per cent. and a death rate for the entire population of 7·04 per cent.

## ACCRA.

Out of 766 native officials resident in Accra, 459 contracted Influenza, the disease proving fatal in 8 instances and resulting in a case-mortality of 1·74 per cent.

266 members of the Police Force were attacked, the disease proving fatal in one instance only, and giving a case-mortality of .37 per cent.

Out of 373 prisoners in the gaol, 220 were attacked and there were 18 deaths, a case-mortality of 8·18 per cent.

The disease appeared in Accra early in September and by the middle of the month had become wide-spread. It was impossible to ascertain the number of cases amongst the general population, but the number of deaths registered between the 3rd September and the 23rd October, over and above those for the corresponding period for 1917, amounted to 655, and assuming for the moment that the general population were attacked in the same ratio as the native Government Officials, some 13,000 natives must have contracted the disease, which gives a case-mortality rate of 5·03 per cent. or 2·62 per cent. of the native population.

During the same period 22 still births were registered as compared with 11 during the corresponding period of 1917.

The accompanying chart shews the total deaths, the deaths from Influenza, the deaths from Pneumonia and Influenza, and the still births, registered in Accra between the 3rd of September and the 25th October, 1918.

Amongst 82 Europeans attacked in Accra there were 8 deaths, a case-mortality of 9·75 per cent.

The following is taken from the Senior Medical Officer's report :—

" The pandemic had already assumed considerable proportions amongst the natives of Accra and Christiansborg before it affected any members of the European community. The first of the white population to suffer were those whose duties brought them into daily and close contact with the natives. The earliest case notified was the Police Magistrate, 18th September, 1918, then followed in rapid succession members of various firms, officials of the Post Office, Customs and Police. On the 30th September, when the pandemic appeared to be at its height, 17 fresh cases were reported and by the end of the month the total had reached just over 60. From then on there was a steady decline until the 10th October when the last case was recorded, the total for three weeks amounting to 82.

" Unhappily the appearance of the pandemic in this neighbourhood synchronised with a " spell of quite unusually cold weather with high winds, and to this unfortunate coincidence " may be attributed the grave character of the outbreak and the high ratio of pulmonary " complications.

" *Incubation period.*—From 2-4 days. The onset sudden, but greatly varying in " character from what was little more than a severe nasal and pharyngeal catarrh to a " high fever with urgent symptoms and great prostration.

" *Types of disease.*—Apart from the typical uncomplicated cases—39 out of a total " of 82—the disease manifested itself in a variety of forms, of which that affecting the " respiratory passages was by far the most common. In two patients only gastro-intestinal " symptoms—vomiting and diarrhoea—predominated at the onset. Only one, who later " developed double pneumonia, presented marked cerebral symptoms in the earlier stage.

" Certain symptoms were common to all cases, although they varied greatly in severity.

" 1. General malaise, insomnia and prostration, with aching in the back and limbs.

" 2. Pyrexia of sudden onset, but only in a very few cases ushered in by an initial " chill.

" 3. Congestion of palpebral and scleral conjunctivæ, occasionally accompanied by " photophobia.

" 4. Frontal headache.

" 5. Congestion of palate and pharynx. The appearance of the throat was " perfectly characteristic: a deep congestion of the soft palate and a peculiar rawness " of the pharynx, as if the mucosa of the posterior wall had been scraped with a " grater. It was an irregular, bright red, angry injection extending from the " posterior nares above to the lower limit of the pharynx below. It looked, and to the " patient felt, 'raw.'

" Accompanying this acute pharyngitis there was usually a hard, dry, hacking " cough.

" 6. A feeling of oppression and tightness behind the upper half of the sternum " and attached costal cartilages.

" 1. In the *uncomplicated cases* (39) the above description might be taken as fairly " typical. The duration of the fever did not exceed four days. The initial temperature " averaged between 101° and 102°, in only two cases exceeding 103°. Convalescence was " usually established by the 5th day, the patient feeling quite well with no other discomfort " than a little dry cough, which continued for a few days.

" In two the pharyngeal congestion extended to the middle ear, resulting in one in a " perforation of the drum.

" Two others reported vomiting and diarrhoea on the first day.

" 2. *Cases who developed a slight capillary bronchitis* (15).—These were rather more severe, " beginning with a temperature of 102°-103° and lasting one or two days longer. The lower " edge of the right lower lobe was the part usually affected.

" 3. *Broncho-pneumonia* (14).—In many of these the lungs did not become appreciably " affected until the 3rd day. The temperature was higher, 103°-104°, and the period of " pyrexia was more prolonged. In the more severe cases—four were distinctly grave—" respiratory distress was considerable; the cough constant and troublesome; expectoration " abundant, containing purulent matter, and in several instances brightly tinged with blood. " Convalescence in many was greatly delayed and in two was complicated by malaria.

" 4. *Diffuse bronchitis* (4).—From the onset these cases were grave. In three signs of " cardiac failure were evident from the beginning. Two developed a petechial eruption on the " day before death. Both lungs were affected with a diffuse capillary bronchitis, no doubt " aggravated by cardiac weakness and incompetence in the 3 fatal cases. The fourth was a " young man who had been in residence in West Africa for only a short period.

" The duration of the disease averaged 6-7 days. The temperature throughout " maintained a level between 104° and 105°, the pulse corresponding except in the one who " recovered, in whom it never exceeded 90. Heavy albuminuria was noted in the fatal cases. " Repeated nasal haemorrhage was recorded in one.

" 4. *Lobar pneumonia, single* (4).—These patients were very ill from the beginning. In two the disease ended by crisis on the 8th day. In one the fever subsided more gradually, and in the last, in whom heart failure threatened, return to normal was delayed and subsequent recovery was very protracted. In this last case, also, albuminuria was present in the urine in considerable quantity.

" Respiratory distress was marked in all.

" The cough was exhausting and expectoration of thick mucus-pus abundant and tinged with blood.

" 5. *Double lobar pneumonia* (6).—Five of these proved fatal. In three the disease ended on the 6th day. In the fourth, a very severe but at first uncomplicated influenza, the temperature had almost fallen to normal on the 6th day, when double pneumonia set in and ended fatally on the 12th day. The fifth patient showed marked cerebral symptoms on the 5th day of his illness. He developed right lobar pneumonia on the 9th, left lobar pneumonia on the 11th, and died on the 15th day.

" The last patient was admitted with right lobar pneumonia. He was discharged apparently cured, but re-admitted with left lobar pneumonia the next day. He made a good recovery.

" The fact which impressed itself more than any other, was the absolute necessity for immediate rest in bed on appearance of the disease. Whenever this was done, the course of the illness was mild, of short duration and followed by rapid recovery."

#### GENERAL OBSERVATIONS.

Further references to the outbreak will be found in the Acting Pathologist's Report in the Appendix in which in addition to describing his own clinical experience of the outbreak he records the fact that "cultures were made from 26 of the 34 specimens of sputum after washing in sterile normal saline and a delicate cocco-bacillus which was Gram negative was grown on blood agar or 'tryagar' in 15."

The following references are made to the outbreak in the Report of the Registrar of Births and Deaths for the year 1918:—

" The total number of deaths at all ages registered was 5,083, an increase of 1,919 over the previous year, the number of males and females being 2,994 and 2,089 respectively. It will be seen that there is an abnormal increase in the number of deaths registered and this is practically entirely accounted for by the outbreak of Influenza which occurred in September and October. It is no exaggeration to say that at least 4 per cent. of the population was wiped out during September and October from Influenza alone.

" The Medical Officer of Health, Secondee, was able to make a census of a controlled portion of the population in Secondee and writes as follows:—"The mortality rate during the recent epidemic of Influenza in Secondee was about 4·55 per cent. This figure is obtained from 2,599 natives employed in various Government Departments and by private firms, and also includes 80 Europeans (no deaths occurred among Europeans in Secondee).

" It is interesting to note also that the lowest number of deaths for one month occurred during December and this is probably explained by the fact that a certain number of those who would have died in that month in the normal course of things were carried off by Influenza and also that the population was decreased by 4 per cent. of its normal figure."

It is difficult to estimate the total number of deaths caused by the epidemic.

In all probability the case mortality rate was greater in the coastal towns than in the forest country in the interior of the Colony and in Ashanti owing to the cold winds prevailing at the time on the coast, and similarly it was as great in the Northern Territories as it was on the coast owing to the fact that the epidemic prevailed in the Northern Territories during the trying Harmattan season and raged among a people of whom the majority wear no clothes.

The Medical Officer of Health estimates the mortality rate in Secondee at 4·55 per cent.

The Senior Sanitary Officer considers it amounted to about 4 per cent. of the population, whilst the estimated mortality for Ashanti is about 2 per cent., and in the North-Western Province of the Northern Territories about 7 per cent.

If we assume that the general mortality rate amounted to 4 per cent. of the population, the total number of deaths caused by the epidemic, based on the population at the last census, 1,503,386, amounted to 60,135.

#### PREVIOUS HISTORY OF THE DISEASE.

It has been stated that previous outbreaks of the disease have occurred in the Colony, and there is a reference to what was alleged to have been an outbreak of Influenza in the Annual Medical and Sanitary Report of the Gold Coast for the year 1892, which reads as follows :—

“ Towards the end of 1891, the first symptoms of Influenza were observed in the Colony, but as these so very closely resemble those of endemic malarial fever the presence of the epidemic disease amongst us was not readily recognised until it had attained a definite degree of development.

“ The Chief Medical Officer and myself addressed a public meeting in Accra convened for the purpose of warning the people against the pernicious system of cold ablutions in these cases. The natural history of the disease under the cold water system was, according to my researches in Accra, as follow :—1st day malaise ; 2nd day fever treated with cold baths ; 3rd day fever with broncho-pneumonia treated also with cold baths ; 4th day death in the afternoon or evening.”

It must be remembered that the outbreak referred to occurred before the discovery of the plague bacillus had made the detection of that disease easy and certain. A disease described as always ending fatally in double pneumonia on the fourth day is very suggestive of plague.

From the point of view of the student of epidemiology not the least interesting symptom of an epidemic is the desire of the multitude to cut off someone's head.

In ancient times it was often sought to propitiate the gods by means of human sacrifice.

The very natural resentment at this visitation found its vent in attacks upon Government in the lay press.

The following hymn composed and circulated by a native indicates something of the depression caused by the epidemic :—

HYMN 986.

*In Time of Pestilence.*

1. In grief and fear, to thee, O Lord,  
We now for succour fly,  
Thine awful judgments are abroad,  
O shield us, lest we die.
2. The fell disease on every side  
Walks forth with tainted breath ;  
And pestilence, with rapid stride,  
Bestrews the land with death.
3. O look with pity on the scene  
Of sadness and of dread,  
And let thine angel stand between  
The living and the dead.
4. With contrite hearts to thee, our King,  
We turn, who oft have strayed ;  
Accept the sacrifice we bring,  
And let the plague be stayed.

As it was suggested that the high case-mortality among the Europeans might have been contributed to by the long tours of service resulting from the war, the accompanying table has been prepared giving in as many instances as possible information with regard to the length of tour of those attacked and it will be seen that no connection can be traced between length of tour and severity of attack or case-mortality rate.

I wish in conclusion to pay a tribute to the work of my colleagues during the period of the pandemic and to record my appreciation of the manner in which the native staff worked faithfully and untiringly throughout.

The following telegram from a Dispenser in charge of an out-station sent at the beginning of the outbreak, is characteristic of the spirit in which they met and endeavoured to combat it.

“ To Honourable

“ Principal Medical Officer,

“ ACCRA.

“ 27/9/18. I have several cases of doubtful fever, symptoms of which “ are headache, cough, fever and weakness of limbs amongst town people “ and school children.

“ DISPENSER.”

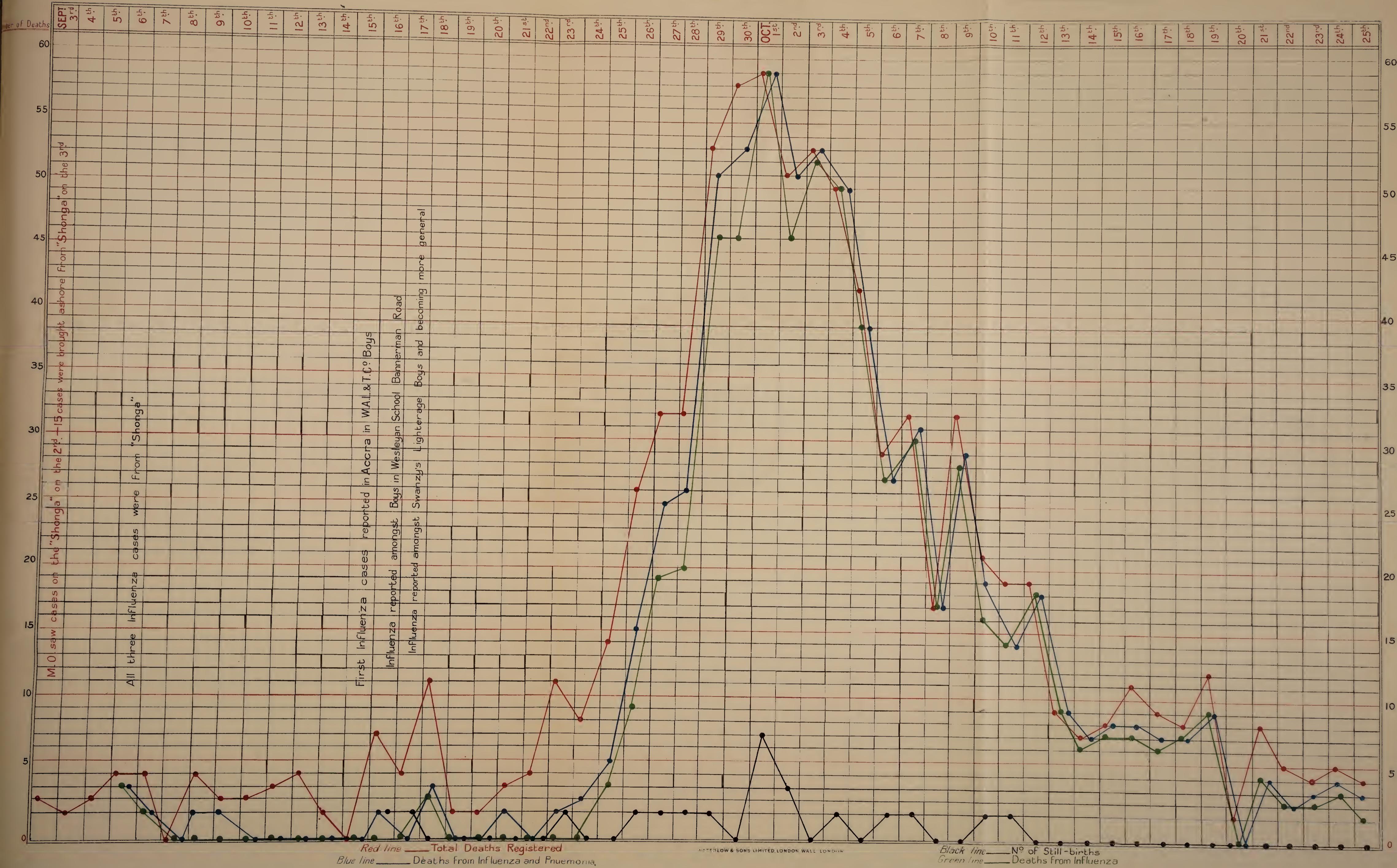
TABLE GIVING DETAILS OF CASES.

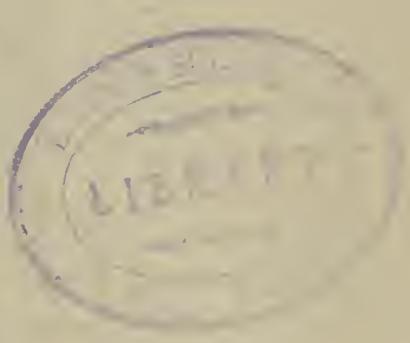
Name.	Last tour.	Last leave.	Present tour.	No. of days ill.	Character of attack.	Result.	Remarks.
R. W. A. W.	18	5	36	4	Slight ...	—	—
H. I. F.	—	—	14	10	Severe ...	—	Since previous tour with B.E.F. in France.
C. C. C.	14	5	15	14	Severe ...	—	—
A. W. M.	—	—	6	8	Severe ...	—	Died. Previous tour unknown duration at Sherboro.
I. P. ...	First tour	—	36	21	Severe ...	—	Meningitis.
H. C.	First tour	—	8	3	Slight ...	—	—
C. N.	First tour	—	28	3	Slight ...	—	—
S. L. B.	?	?	18	15	Slight ...	—	—
M. B. H.	14	3	12	2	Very Slight ...	—	Catarrhal symptoms with temperature 100°-101° only.
D. D.	16½ months	4 months	5 months	5	Mild ...	Recovery	—
C. E. H.	—	—	2½ years	10	Mild ...	„	—
A. E. S.	1 year	9 months	3 years	15	Fairly severe	„	—
E. C. S.	2 years	1 year	2½ years	25	Very severe ...	„	—
E. J. C.	—	—	2½ years	20	Severe ...	„	Invalided.
W. R.	11 months	?	9 months	7	Very Severe ...	Death	In poor health previously. Would not lie up in time.
R. H. B.	30 months	?	6 months	12	Moderately severe.	Recovery	—
J. C. ...	?	?	2½ years	28	Very severe ...	„	Invalided.
R. Le F.	—	—	7 weeks	11	Severe ...	„	From barque Moliere.
L. B. ...	—	—	7 weeks	11	Moderately severe	„	„
J. A. ...	?	?	?	3	Very mild ...	„	—
F. ...	—	—	9 years	10-12	Very severe ...	„	—
L. W.	—	—	2½ years	8	Very mild ...	„	— .
S. C. W.	2 years	16 months	2 months	15	Severe ...	„	Prolonged convalescence.
W. H. H.	14 months	3 months	6 months	16	Severe ...	„	—
A. E. L.	First tour	5	9	7	Mild ...	„	—
D. W. R.	Gone home	—	—	7	Mild ...	„	—
H. C. B.	—	3	11	7	Fairly severe	„	—
G. P. F.	—	4	14	6	Mild ...	„	—
W. B.	Gone home	4	13.5	5	Mild ...	„	—
W. M.	12 months	4	8	8	Mild ...	„	—
H. S. M.	24	2	17	21	Severe ...	„	—
M. F. Q.	16 (Ivory Coast)	4	11	9	Mild ...	„	—
G. N. B.	11.5	5	7	16	Severe ...	„	—
S. J. ...	8	4	4	14	Severe ...	„	—
E. G. T.	8	3	10	5	Mild ...	Recovered	—
G. G.	12	4	9	11	Severe ...	Died	—
P. M. G. J.	13	5	7	11	Mild ...	Recovered	—
E. Mc. Q.	First tour	—	9	10	Severe ...	„	—
H. W. J.	16	5	6	17	„ ...	„	—
J. Mc. G.	13	4	6	15	„ ...	„	—
E. B. ...	10	6	3	10	Fairly severe	„	—
W. W. B.	14	4	9	4	Severe ...	Died	—

# Influenza Outbreak

# ACCRA

Sept - Oct 1918





Name.	Last tour.	Last leave.	Present tour.	No. of days ill.	Character of attack.	Result.	Remarks.
A. C. B. ...	Left	5	5	8	Mild ... ...	Recovered	—
W. B. ...	Gone home	—	10	15	“ ... ...	“	—
J. E. K. ...	First tour	—	5	23	Severe ...	“	—
H. S. G. ...	15	4	6	21	“ ..	“	—
H. W. T. ...	17	4	21	5	Mild .. ...	Cured	—
T. A. F. ...	15½	3	14	11	“ ...	“	—
J. C. ...	19½	4	9	5	“ ...	“	—
T. T. ...	18	5	12	11	Bronchitis ...	“	—
J. G. ...	Gone home	—	36	5	Mild ... ...	“	—
A. C. ...	“ “	—	36	9	“ ...	“	—
E. H. ...	30	6	8	8	Bronchitis ...	“	—
G. H. ...	36	4	10	7	“ ...	“	—
S. C. M. ...	22½	5	3½	7	Mild ... ...	“	—
R. M. ...	22	4	12	5	“ ... ...	“	—
J. D. ...	14	6½	12	10	Bronchitis ...	“	—
P. B. ...	Nil	Nil	30	4	“ ...	“	—
P. M. ...	15	2	15	5	Mild ... ...	“	—
R. E. K. ...	Nil	Nil	6½	9	Severe ...	Death	—
M. N. F. ...	16 months	6 months	9 months	32	—	—	—
R. T. H. ...	15 “	5 “	11 “	17	—	—	—
C. J. W. ...	16 “	5 “	21 “	8	—	—	—
F. P. O.'S. ...	—	—	—	8	—	—	—
J. N. ...	15 “	3 “	11 “	5	—	—	—
J. R. F. ...	—	—	4 “	11	—	—	—
W. V. P. ...	17 “	5 “	6 “	6	—	—	—
C. W. F. ...	12 “	4 “	9 “	25	—	—	—
E. G. ...	—	—	15 “	5	—	—	—
J. G. T. ...	12 “	4 “	9 “	8	—	—	—
Capt. J. G. F. ...	—	—	—	12	—	—	—
J. B. F. ...	—	—	19 “	7	—	—	—
Lieut. P. B. ...	—	—	—	11	—	—	—
H. B. ...	15 months	6 months	9 months	7	—	—	—
F. B. ...	—	—	9 “	22	—	—	—
Capt. R. D. ...	—	—	—	6	—	—	—
A. W. McM. ...	15 months	5½ months	8 months	2	—	—	—
J. R. T. ...	15 “	4 “	13 “	3	—	—	—
S. A. M. ...	10 “	100 days	12 “	7	—	—	—
F. C. D. ...	13 “	5 months	18 “	5	—	—	—
E. C. W. ...	—	—	—	6	—	—	—
Miss F. M. D. ...	—	—	18 months	6	—	—	—
E. H. ...	1st tour since March, 1914.			15	—	—	—
S. A. C. ...	18 months	5 months	7 months	10	—	—	—
R. R. ...	1st tour	—	—	6	—	—	—
F. G. S. ...	1st tour	—	13 months	8	—	—	—
G. N. B. ...	—	—	—	12	—	—	—

Name.	Last tour.	Last leave.	Present tour.	No. of days ill.	Character of attack.	Result.	Remarks.
J. Q. ...	—	—	—	13	—	—	—
C. H. McL. ...	—	—	—	10	—	—	—
E. O. G. ...	22 months	5 months	14 months	—	Severe ...	—	—
H. H. ...	15 „	3 „	22 „	14	Slight ...	—	—
F. B. ...	43 „	5 „	12 „	22	Very severe ...	—	—
A. M. ...	2 „	8 „	12 „	8	Slight ...	—	—
C. P. ...	—	—	15 „	10	„ ...	—	—
Rev. A. A. S. ...	12 months	9 months	12 „	11	Severe ...	—	—
Rev. A. ...	18 „	6 „	16 „	9	„ ...	—	—
J. E. S. ...	15 „	5 „	19 „	10	„ ...	—	—
E. A. T. ...	17 „	5 „	21 „	7	Slight but convalescence prolonged.	—	—
J. P. ...	Nil	Nil	11 „	—	Very severe ...	Cured	Pneumonia both bases. Albuminuria. Slow convalescence, still unfit. Previously gassed.
S. S. ...	Nil	Nil	*G.E.A.	14	Sharp ...	„	—
H. S. W. ...	Nil	Nil	9 months	20	„ ...	„	Slight albuminuria.
H. S. B. ...	Nil	Nil	—	30	Very severe ...	„	Pneumonia both bases. Albuminuria. Slow convalescence. Invalided.
W. H. ...	Nil	Nil	G.E.A.	9	Very severe ...	Died	Pneumonia both bases. Albuminuria. Persistent delirium.
Mc E. ...	Nil	Nil	G.E.A.	21	Sharp ...	Cured	Much laryngitis, previously gassed. Scarletiform rash. Albuminuria.
C. D. ...	—	—	G.E.A.	5	Slight ...	„	Heart failure in morning, complete convalescence.
H. R. ...	—	—	G.E.A.	16	Sharp ...	„	Complete convalescence.
W. G. S. ...	Nil	Nil	10 months	8	Slight ...	„	Convalescence complete.
T. B. ...	12 months	4 $\frac{1}{4}$ months	Completed 8 months of 12 months' tour.	4	Attack sudden	Death ...	Ending in Pneumonia.
J. S. ...	12 „	4 „	Completed 9 months of 12 months' tour.	2	Sudden, with shivering.	„ ...	Brought into Hospital in dying state.
I. T. W. ...	8 „	6 „	Completed 7 weeks of tour.	3	Fever, severe pains in back head.	„ ...	Ending in Pneumonia.
H. P. ...	13 „	3 „	—	17	—	Recovered	„ „ „
B. ...	18 „	4 „	9 months, extended to 18 months.	21	Cough ...	„	„ „ Bronchitis.
W. Y. ...	12 „	5 „	12 months	13	—	„	„ „ General Debility.
E. ...	12 „	4 „	12 „	10	—	„	„ „ „
E. S. ...	12 „	4 $\frac{1}{4}$ „	12 „	13	—	„	„ „ „
W. D. T. ...	14 „	5 „	12 „	9	—	„	„ „ „
C. M. ...	13 „	4 „	—	5	—	„	„ „ Bronchitis.
A. W. E. ...	Believed to have been on Coast 3 years.	—	—	7	Severe ...	Death ...	„ „ Pneumonia. Heart failure,
J. F. ...	Nil	Nil	12 months	10	Slight ...	Cured ...	—
R. ...	Nil	Nil	10 „	30	Very severe ...	„ ...	Pneumonia, pleurisy, Acute Nephritis, Scarletiform rash. Invalided.
A. B. ...	Nil	Nil	9 „	32	Not severe ...	„ ...	Readmitted with sub-Acute Appendicitis.

\* G.E.A. denotes Service in German East Africa.

Name.	Last tour.	Last leave.	Present tour.	No. of days ill.	Character of attack.	Result.	Remarks.
H. D. ...	Nil	Nil	5 months	9	Sharp ...	Cured ...	Convalescence rapid and complete.
A. W. N. ...	Nil	Nil	10 ,,	6	Mild ...	," ...	—
F. MacG. ...	14½ months	4 months	12 ,,	15	," ...	," ...	Tonsilitis.
F. A. ...	Nil	Nil	—	5	," ...	," ...	Supra Orbital Neuralgia.
E. O. S. ...	—	—	—	5	," ...	," ...	—
Rev. Father P. ...	—	—	—	11	Sharp ...	," ...	—
Rev. Father M. ...	—	—	—	—	," ...	," ...	Pleurisy.
H. B. ...	Nil	Nil	16 months	25	," ...	," ...	Slow convalescence. Proceeded on leave. Gassed.
A. H. B. C. ...	Nil	Nil	*G. E. A.	2	Very slight ...	," ...	—
S. M. H. ...	15 months	4 months	13 months	6	Slight ...	," ...	—
J. B. ...	Nil	Nil	—	6	," ...	," ...	—
H. E. ...	—	—	—	5	," ...	," ...	—
E. E. G. ...	16 months	4 months	19 months	6	," ...	," ...	—
A. S. L. ...	Nil	Nil	—	10	," ...	," ...	—
F. K. ...	Nil	Nil	—	9	," ...	," ...	—
G. H. ...	30 months	7 months	22 months	10	Severe ...	Recovery	—
J. B. ...	—	—	27 ,,	13	Moderate ...	," ...	Extreme debility afterwards.
Mrs. R. J. ...	20 months	—	6 months	5	Slight ...	—	—
T. ...	15 ,,	2½ months	10 ,,	7	," ...	Recovery	—
C. ...	—	—	25 ,,	12	Moderate ...	," ...	—
R. ...	34 months	7 months away	6 ,,	14	Severe ...	," ...	Pneumonia.
R. ...	—	—	12 ,,	4	Slight ...	," ...	—
A. T. ...	14 months	4 months and 10 days	Over 13 months	5	," ...	," ...	—
H. ...	18 ,,	3 months	2 months	14	Sharp ...	Cured ...	Slow convalescence. Supra orbital neuralgia.
T. B. I. ...	Nil	—	9 ,,	14	," ...	," ...	Previously gassed.
R. C. ...	Nil	—	9 ,,	10	Very slight ...	," ...	Nil.
A. J. T. ...	—	—	—	6	Severe ...	Died ...	Pneumonia. Albuminuria. Previously gassed.
W. M. ...	—	—	—	14	," ...	Cured ...	Pneumonia.
J. C. S. McD. ...	16 months	4 months	12 months	10	," ...	," ...	Complete convalescence.
W. H. ...	18 ,,	5 ,,	7 ,,	31	Sharp ...	," ...	Slow convalescence.
Mrs. H. ...	18 ,,	5 ,,	7 ,,	14	," ...	," ...	Convalescence fairly rapid.
A. H. M. ...	—	3 ,,	10 ,,	31	," ...	," ...	Complicated with Remittent Malaria, very slow convalescence. Invalided. Gassed.
P. R. G. ...	—	—	11 ,,	25	Severe ...	," ...	Very slow convalescence. Invalided.
E. P. D. ...	—	—	G. E. A. 9 months	20	Sharp ...	," ...	Much persistent laryngitis and cough. Loss of weight. Gassed. Ultimate complete convalescence.
W. G. W. ...	15 months	3½ months	9 ,,	20	Not severe ...	," ...	Slow convalescence. Boils.
R. M. ...	—	—	10 ,,	30	Severe ...	," ...	Pneumonia. Delirium. Slow, but complete convalescence. Scarletiform Rash.
N. A. ...	14 months	4 months	7 ,,	10	," ...	Recovered	His recovery was retarded a few days by an intermittent tertian fever which rapidly yielded to quinine. He has been well since.

\* G.E.A. denotes Service in German East Africa.

## (b) EUROPEAN OFFICIALS.

TABLE SHOWING THE SICK, INVALIDING AND DEATH RATES OF EUROPEAN OFFICIALS.

		1916.	1917.	1918.
Total number of Officials resident	... ... ...	589	597	515
Average number resident	... ... ...	468	489	413
Total number on Sick List	... ... ...	354	534	656
Total number of days on Sick List	... ... ...	2,868	4,582	5,987
Average daily number on Sick List	... ... ...	7·8	12·5	16·4
Percentage of Sick to average number resident	...	1·66	2·55	3·97
Average number of days on Sick List for each Patient		8	8·58	9·12
Average sick time to each resident	... ... ...	6·12	9·37	14·49
Total number Invalided	... ... ...	24	19	54
Percentage of Invalidings to total residents	...	4·07	3·18	10·48
Percentage of Invalidings to average number resident		5·13	3·88	13·07
Total deaths	... ... ... ...	4	9	6
Percentage of Deaths to total residents	... ...	0·67	1·50	1·16
Percentage of Deaths to average number resident	...	0·85	1·84	1·45

The total number of days on the sick list, 5,987, a considerable increase on the abnormal return of the previous year although there were fewer European officials in residence, shews the influence of the epidemic of influenza on the sick returns. An analysis of this return indicates that 2,584 days are attributable to tropical diseases, the balance 3,403 being due to non-tropical complaints. These figures, again shewing the influence of the influenza epidemic, are in striking contrast to those for 1917 in which year 2,550 days were attributable to tropical diseases and 2,032 to non-tropical complaints.

10. *Causes of Invaliding of European Officials.*—Adenitis (1), appendicitis (1), blackwater fever (1), debility (7), fever (undiagnosed) (2), fistula in ano (2), frontal sinusitis (1), haemorrhoids (2), influenza (5), injury (1), insomnia (1), jaundice (1), malaria (10), neurasthenia (11), periph. neuritis (1), pyorrhœa (3), rheumatism (1), tabes (2), tuberculosis (1); total 54.

The invaliding rate, 104·8 per 1,000 shews a marked increase on that of the previous year, 31·8 per 1,000.

The following table shews, in periods, the approximate length of tour of those invalidated and reveals the marked effect of the increased length of tour upon the rate:—

## INVALIDINGS—EUROPEAN OFFICIALS.

6 months and under	...	3
6-12	,, ... ... ..	22
12-18	,, ... ... ..	23
18-24	,, ... ... ..	5
over 24	,, ... ... ..	1
		—
Total	...	54
		—

Of the total of 54 invalidated, 24 were military officers and 30 were civilians.

11. *Causes of Death of European Officials.*—blackwater fever (2), influenza (4); total 6.

In spite of the influenza epidemic it will be seen that the death rate fell from 15 per 1,000 in 1917 to 11·6 per 1,000, and but for the deaths from influenza, would have fallen to 3·8 per 1,000.

## (c) NATIVE OFFICIALS.

TABLE SHOWING SICK, INVALIDING AND DEATH RATES OF NATIVE OFFICIALS.

		1916.	1917.	1918.
Total number of Officials resident	... ... ...	1,790	1,931	2,158
Average number resident	... ... ...	1,701	1,882	2,041
Total number on Sick List	... ... ...	499	765	1,321
Total number of days on Sick List	... ... ...	4,156	6,228	13,520
Average daily number on Sick List	... ... ...	11	17	37
Percentage of Sick to average number resident	...	0·65	0·90	1·81
Average number of days on Sick List for each Patient	...	8·3	8·1	10·23
Average sick time to each resident	... ... ...	2·44	3·30	6·62
Total number Invalided	... ... ...	9	8	8
Percentage of Invalidings to total residents	... ...	0·5	0·41	0·37
Percentage of Invalidings to average number resident	...	0·52	0·42	0·39
Total Deaths	... ... ...	10	12	44
Percentage of Deaths to total residents	... ...	0·55	0·62	2·03
Percentage of Deaths to average number resident	...	0·58	0·63	2·15

The abnormal figures shewn in the above table, total number of days on sick list 13,520, and death rate 20·3 per 1,000 are indications of the ravages of the influenza epidemic.

12. *Causes of Invaliding of Native Officials.*—Blindness (1), cardiac (1), cystitis (1), mania (2), polyarthritis (2), tuberculosis (1); total 8.

13. *Causes of Deaths of Native Officials.*—Burn (1), influenza (30), meningitis (1), nephritis (1), pneumonia (7), rheumatism (acute) (1), tuberculosis (3); total 44.

## (d) GENERAL EUROPEAN POPULATION.

(i.) Government Officials	... ...	515
(ii.) Employés of Trading Firms	... ...	681
(iii.) Employés of Mining Companies	...	578
(iv.) Missionaries	... ... ...	49
		<hr/>
	Total ... ...	1,823

TABLE SHOWING THE SICK, INVALIDING AND DEATH RATES OF EUROPEAN NON-OFFICIALS.

How employed.	Number.	Deaths.	Invalided.	Death rate per cent.	Invaliding rate per cent.
<hr/>					
1916.					
MERCHANTS	... ...	671	6	36	0·89
Mining Companies	... ...	642	3	43	0·46
Missionaries	... ...	109	1	2	0·91
Totals	... ...	1,422	10	81	0·70
					5·69
<hr/>					
1917.					
MERCHANTS	... ...	718	11	45	1·53
Mining Companies	... ...	718	6	48	0·83
Missionaries	... ...	139	1	2	0·72
Totals	... ...	1,575	18	95	1·14
					6·03
<hr/>					
1918.					
MERCHANTS	... ...	681	19	26	2·79
Mining Companies	... ...	578	29	21	5·01
Missionaries	... ...	49	2	—	4·08
Totals	... ...	1,308	50	47	3·82
					3·59

The death rate, 38·2 per 1,000, as compared with that of 11·4 per 1,000 for 1918 and 9·4 for the previous three years, shews the extent to which the influenza epidemic affected the European non-official death rate.

14. *Causes of Invaliding of European Non-Officials.*—Adenitis (3), alcoholism (1), appendicitis (1), blackwater fever (2), debility (2), dermatitis (1), enteric (1), epilepsy (1), influenza (4), injury (2), jaundice (1), malaria (9), neurasthenia (4), neuritis (2), otitis media (1), perityphlitis (1), pneumonia (1), phthisis (5), prostatitis (1), rheumatism (3), splenitis (1); total 47.

15. *Causes of Deaths of European Non-Officials.*—Alcoholism (1), black-water fever (4), cancer (2), cardiac (1), dysentery (1), hyperpyrexia (1), influenza (25), injury (1), malaria (2), pneumonia (5), phthisis (3), senility (1), syncope (1), toxæmia (1), yellow fever (1); total 50.

#### EUROPEAN MORTALITY AND INVALIDING RATES, 1918.

Total Strength.	Deaths.	Invalidings.	Death rate per 1,000.	Invaliding rate per 1,000.
Official ... 515	6	54	11·65	104·85
Non-Official ... 1,308	50	47	38·22	35·93
Totals ... 1,823	56	101	30·71	55·40

The final figures quoted above reveal a general European death rate out of all proportion to any figures that can be quoted for recent years; a death rate of 30·71 per 1,000, and show also a striking contrast between the European Official and Non-Official death rate, the former not much above the normal for recent years, the latter attaining the alarming figure of 38·22 per 1,000.

This abnormal European Non-Official death rate was undoubtedly largely due to the epidemic of influenza which accounted for 25 deaths, whilst 5 are attributed to pneumonia, probably consequent on the former infection.

It is difficult to account for the case-mortality being so high amongst the European Non-Officials as compared with the European Official rate, but it was possibly to some extent due to their not seeking medical treatment in the early stages of the disease and also to the fact that owing to the shortage of medical officers many of them were not within reach of medical aid when first attacked.

16. *Clothes.*—In the course of a report written during the year after a tour of the Northern Territories I wrote as follows on this subject:—

" Let me commend the European kit in the Northern Territories, a " bush shirt and a pair of shorts; it mitigates the discomforts of the " hottest day. I think it would add to the amenities of life were it more " generally adopted in the Colony. \* \* \* \* \* I still have vivid " memories of appallingly sultry evenings garbed in the clothes of so- " called civilization. \* \* \* \* \* Some garb decent and sanitary and " cool should be prescribed for these occasions."

I think we are too apt to follow precedent unthinkingly with regard to clothing in the tropics.

Nothing should be worn that cannot be sent to the wash.

The heavy, blue, gold-braided uniform worn by high officials on ceremonial occasions is markedly unsuited for tropical wear, whilst the cocked hat often worn with it is absolutely useless as a protection from the sun during the heat of the day.

The ordinary white Civil Service uniform also would be less uncomfortable were the tunic turned down and open at the throat to enable a soft collar and tie to be worn with it. Rank could surely be indicated on the sleeves.

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### III.—SANITATION.

#### A.—GENERAL REVIEW OF WORK DONE, LAWS PASSED, AND PROGRESS MADE.

##### (i.) ADMINISTRATIVE.

The conditions under which the work of the Department was carried on during the year under review were even more stringent than in the previous year. Supplies of the necessary materials for the various working elements of the routine, became increasingly difficult to obtain, nevertheless the organisation was satisfactorily maintained.

The European element of the staff has been greatly depleted, and it was only for a few months at the beginning of the year that a Sanitary Officer was available for tours of inspection. The Addah and Quittah districts were visited and the stations and towns on the Accra-Tafo and Secondee-Coomassie lines inspected. Conditions generally were found to be uniformly good and many improvements have been introduced within the confines of the stations along both lines.

Medical Officers of Health were stationed at Accra, Secondee and Coomassie during the whole year, but Cape Coast was without the services of a full time Officer for the entire period. The number of Superintending Sanitary Inspectors was also decreased, and the officers stationed at Accra and Secondee had to perform the duties of Municipal Inspector in addition to their own. The native Staff, as a whole, has worked well under exacting conditions, but the necessity for more complete supervision, and more frequent tours of inspection was demonstrated by the failure on the part of a few of those in the more detached stations to realise their responsibilities and to work up to them.

The completion of the new Coastal Road will, when the staff is more normal, provide greatly increased facilities for tours of inspection. The cocoa districts behind Winnebah, Saltpond and Cape Coast have been made more accessible. The larger towns have had the benefit of inspection and advice for years, but the smaller hamlets which the road has exposed, have only had a fleeting attention at wide intervals. These small rural communities will provide a sphere for work which can only be undertaken with an increased staff, but there is no doubt of the benefits that will accrue to the people themselves and to the country in general from putting these smaller villages upon a sound hygienic and sanitary footing.

The year 1918 will long be memorable, apart from its distinction of seeing the cessation of hostilities, by the epidemic of influenza which reached the Coast Towns in September and rapidly spread over the whole country and attained a virulence which no other disease has approached since the epidemic of influenza that raged during the latter months of 1891.

One new Ordinance bearing on public health was passed during the year, and is cited as the Diseases of Animals Ordinance No. 27 of 1918.

It was rendered necessary in order to give fuller powers to deal with the various outbreaks of disease among Cattle in the Colony and its dependencies.

The following Orders-in-Council and Rules were made under various Ordinances.

**UNDER THE INFECTIOUS DISEASES ORDINANCE NO. 2 OF 1908.**

Order-in-Council No. 32 of 1917 ... Revoking Order No. 31 of 1917 and declaring Axim free from infection.

Do. do. No. 11 do. ... Saint Louis, Senegal declared an infected place.

Rule No. 3 of 1918 revoking No. 3 of 1917 made under Section 18 of the Infectious Diseases Ordinance.

Rule No. 3 of 1918 (Ashanti) declaring Anthrax an infectious disease and making regulations for notification of anthrax and small-pox.

Rule No. 4 of 1918 ... Application of previous rule to Northern Territories.

**UNDER DISEASES OF ANIMALS ORDINANCE NO. 27 OF 1918.**

Proclamation No. 56 of 1918 ... Defining the Area of Acre for the purposes of the Ordinance.

**UNDER TOWNS ORDINANCE NO. 13 OF 1892.**

Order-in-Council No. 2 of 1918 ... Boundaries of Winnebali rearranged.

Do. do. No. 8 do. ... Great Ningo placed under Towns Ordinance.

**UNDER BIRTHS, DEATHS AND BURIALS ORDINANCE NO. 3 OF 1917.**

Proclamation No. 2 of 1918 ... Secondee Cemetery declared.

**UNDER NORTHERN TERRITORIES ADMINISTRATION ORDINANCE NO. 1 OF 1902.**

Rule No. 1 of 1918 ... Regulation of Towns and Villages.

Notification by Gazette No. 63 of 1918 dated 26/9/18 of outbreak of Influenza at Sierra Leone.

**(ii.) PREVENTIVE MEASURES AGAINST—**

**(1) MOSQUITO AND INSECT-BORNE DISEASES.**

**(a) *Malaria, Yellow Fever, Filariasis, and Dengue.***

These diseases are conveniently grouped together—although the bionomics of the different carriers vary considerably—for the reason that the preventive measures have been so frequently described that there is very little fresh to add. The principal measures adopted are, filling and draining of swamps, borrow pits and wash-outs, clearing of bush and undergrowth, drain and pool inspection with clearing and oiling as required, protection of wells, tanks, and barrels, detection of holes and crevices in trees and treatment by filling with swish and tar, inspection of eaves gutters, house to house inspection and maintenance of mosquito brigades, and fumigation when required.

The large tracts of land which are now kept open as free zones to segregation areas present an expensive problem in the matter of clearing, especially in places like Accra and Coomassie. The experiment has been tried of allocating the land to the different Hausa speaking communities to farm, thereby putting it to a use for the common good and at the same time serving the purposes of the Public Health requirements. By this procedure the land is not denuded of vegetation, while rubbish and undergrowth are disposed of—this being the charter upon which the farmer is allowed to have tenure of his allotment.

The reclamation of the swamp around the Central Prison at Secondee has been continued and 18,680 square yards were filled and levelled by prison labour.

Two cases of yellow fever among Europeans occurred during the year—one at Abosso in March, which ended fatally, and one at Axim in August which was followed by recovery. Among natives of West Africa, two cases were diagnosed and two others put down as suspicious. The two latter occurred at Secondee in June—the patients being two Kroobois—one of whom died.

Of the cases diagnosed as yellow fever, one was a Krooboy and occurred at Koforidua in August. He made a complete recovery.

The second case was a native of the Colony and of the town he lived in. This occurred at Saltpond in September and was followed by recovery.

Several cases of dengue were reported during the year but called for no special action.

(b) Trypanosomiasis does not call for any special mention. There is no evidence that it is on the increase and no special measures beyond the clearing of bush and undergrowth around towns and at fords and watering places, have been taken.

## (2) INFECTIOUS AND EPIDEMIC DISEASES.

Chicken-pox was fairly common during the year, but only in small localised outbreaks of a few cases at a time, mostly among Kroobois, whose practice of herding in one room assures its spread among the susceptible in the quarters affected. Isolation is resorted to chiefly in these cases.

Among infectious diseases of a persistent nature dysentery, with its ally diarrhoea still holds the pre-eminent place. Even in a town like Accra, where the water supply is of a recognised purity, this disease is responsible for a large number of deaths. Apart from actual infection by drinking contaminated water the predisposing factors must be many—and among those two important ones are the use of dirty utensils and the practice of feeding from a common dish with the fingers.

Among children the cause is probably not so difficult to discover, as the making of mud pies and such kindred childish amusements is as common—if not more common—in Africa as it is in countries where dysentery is not prevalent. Advantage is also taken of every pool of water for bathing purposes, however foul the water may be, and it is not unusual for the children to refresh themselves on occasion with mouthfuls of the mixture.

*Enteric.*—One death in a native was reported from Coomassie. Early in the year the incidence of an European case was reported in Accra. The patient was in the habit of using the water from a well in the compound of the factory. Another patient who used the water from the same well was under treatment for dysentery at the same time.

An analysis of the water was made and more than 50,000 colonies per C.C. were counted on agar at 37°C. after 24 hours' incubation. *Bacillus Coli* was present in 10 C.C., but its presence in 1 C.C. was not ascertained.

The well was sealed and afterwards filled in.

*Plague*.—No case was reported during the year. The trapping of rats is maintained in most of the stations.

*Smallpox*.—The outbreak of smallpox which occurred in the Northern Territories during 1917 persisted into 1918. Two vaccinators were sent up and worked in the villages around and between Lorha and Wa.

10,459 vaccinations were performed by them in these districts, 7,489 of which were successful.

#### VACCINATION FIGURES.

	1917.	1918.
Total number vaccinated	... 21,293	14,700
Total number successful	... 15,619	10,726

Those that were not seen again are classed among the unsuccessful, so that the total successful is probably slightly higher than these figures indicate.

*Anthrax*.—No cases among human beings were reported, but an outbreak among cattle occurred in Accra at the beginning of the year. One case occurred in January, and the usual measures as regards burial and disinfection of the ground were taken. An outbreak of cattle plague had been in progress for some time, and certain precautionary measures had been instituted to prevent animals infected with the disease from entering the town or using the pastures frequented by the local and uncontaminated herds. For this purpose inspection and quarantine kraals had been established outside the town on the Dodowah road and an inspector stationed there. By rigid inspection and surveillance, early recognition of cases of disease was assured, and an animal infected with anthrax was found on February 3rd. Altogether ten animals were affected, not counting the first case which occurred in Accra and whose blood was not examined. The evidence goes to show that the original infection came from the north, for, although the first suspicious case came from a yard in the town, this yard was wholly occupied by animals hailing from the north, and after the first suspicious case nearly a month elapsed before the second case appeared, and this was in an animal which had only just arrived from Kpong and had no connection with the aforesaid yard. During the whole time a strict watch was kept upon the local herds at Adabraka and Labadi, and no case occurred among them.

Several cases were found at Koforidua among cattle which had come from the north through Kpong. The actual place of infection was not ascertained.

Somewhat later in the year—in June—four cases were reported at Tarquah among cattle just arrived in a truck from Coomassie. No cases were reported from the latter town. One case was reported from Tarquah in December.

All these cases were diagnosed upon blood examination and the usual measures for disposal and disinfection taken.

*Rinderpest*.—During the early part of the year as a result of the continuance of the effective regime that was built up to combat the outbreak of cattle plague in 1917, sporadic cases were early recognised but there was nothing in the way of an outbreak.

*Influenza.*—The epidemic began first at Secondee, where it was introduced by members of the crew of an infected ship who were landed for treatment. On recognition of the inevitable spread of the disease, no special steps were taken to localise it by isolating the cases as they occurred. All passengers landing however were advised to have their clothes which might have been exposed to infection during the voyage, washed and disinfected by exposure to the sun's rays for a considerable time.

Instructions outlining the measures to be taken were sent to the different stations and left to the local authorities to amplify in any way possible. Special attention was called to the advantages of free ventilation and the admission of sunlight, and instructions given to the effect that all infected clothes should be washed and exposed to the sun. Instructions in personal hygiene were also issued.

The Sanitary Staff visited houses giving advice on the above lines and also demonstrating simple methods of disinfecting rooms which patients had used, but as two-thirds of the Inspectors were down at a time this work was obviously crippled. Instructions upon the best methods to adopt in combating the disease were also conveyed to the chiefs in different towns and districts by the political officers, who did excellent work in this way.

Schools were closed early and public religious services, funeral customs, and other festivals were discountenanced.

Coastwise traffic of natives was discouraged to a considerable extent as all passengers before embarking had to submit themselves for examination and obtain a medical certificate before the Lighterage Company would issue a ticket.

The actual number of deaths that occurred cannot be ascertained, but in Secondee a fairly accurate idea of the general mortality was obtained by taking a census of a controlled population of 2,599 native employees in various Government departments and private firms, and the mortality rate worked out at 4·55 per cent.

### (3) ENDEMIC DISEASES.

*Tuberculosis.*—There is a decrease all round in the number of deaths from this disease registered during the year, but this can only be an apparent fall, as influenza most certainly accounted for the deaths of a number of tubercular subjects who would have died from tuberculosis had not influenza supervened. The general concensus of opinion is that the disease is on the increase, and the medical officer of one of the mining companies has been so impressed with this that he has opened an isolation building for the treatment of his cases. It is an unfortunate fact however that cases of tuberculosis of the lungs are seldom seen until the disease is well advanced. The onset of the disease is so often insidious and lacking in any acute symptoms that it is not until some alarming sign obtrudes itself that relief is sought.

The procedure which was adopted in 1917, following upon the inclusion of tuberculosis among the infectious diseases under the Infectious Diseases Ordinance has been maintained.

After notification of a case, every effort is made to persuade the patient and the people in the house to adopt the usual precautions and to follow the accepted line of treatment.

Most of the cases of tuberculosis are, however, not known of until after death and applications for burial permits are made. Steps are then taken to

disinfect the room the patient occupied, by fumigation or other means, and the occupants of the house are warned of the dangerous nature of the disease and informed of the precautions they should adopt.

Helminthic diseases do not call for any special mention, except that ankylostomiasis was reported as being very common in the Quittah district. There is no doubt that this disease is fairly prevalent along the littoral, more especially in these regions where towns are built upon the sandy belts which enclose the larger lagoons.

The rigid inspection of pigs after slaughter that is made in all the larger towns must to a certain extent have a beneficial effect, but if one may judge by the amount of measly pork that is condemned in the controlled places there must be a much larger quantity of infected meat consumed in the places that are not under observation.

### (iii.) GENERAL MEASURES.

Those measures which are now a matter of routine to Sanitary Inspectors and the local Sanitary organisations generally, have been well maintained.

Some anxiety was occasioned in towns where pan latrines are in use by the shortage of supplies, but strict conservation of the existing stock was exercised and in a few places the use of oil drums and similar receptacles was resorted to.

The absence of fresh supplies of hand-carts for dealing with refuse and household rubbish in the smaller towns has also presented a difficulty, but with intensive repairing of the existing service it was found possible to keep them on the road. Replacement of all the necessary requirements for dealing with conservancy and rubbish disposal, and of tools generally, will have to be made on an extensive scale as soon as supplies can be obtained.

The amount of clearing of bush and undergrowth that is done in all the different stations is very large, and in most places the areas that are cleared are now well defined, and the variation in the total figures depends upon the number of times the clearing is done in accordance with the seasonal demands.

House to house inspection and general supervision has been generally well maintained during the year. The total number of inspections made is 389,626 and larvae were found in 3,510 cases.

The prosecutions for offences under the Towns and Public Health Ordinance and under the Mosquito Ordinance numbered 8,506, with 8,329 convictions, and fines to the amount of £2,468. 3s. 0d. were imposed.

Routine inspection of eaves gutters, wells, tanks, barrels and other water receptacles has been carried on.

*Drainage.*—There has been very little extension of drainage systems done during the year—except at Obuasi, where good work was done in the drainage of the swamp.

The introduction of street surface drains of concrete into a town is a mixed blessing, as in certain sections of the larger towns they are used as sewers, and urine, house slops and rubbish of all kinds are thrown into them, and the work of keeping them clean becomes a difficult matter.

Under Sanitary Improvements, work was restricted to maintenance chiefly, and only minor works of absolute necessity were undertaken.

*Water Supplies.*—The unsatisfactory results obtained from the Puech-Chabal system in dealing with the Densu water for the Accra supply formed the subject of much correspondence during 1917, and on the strength of a report by Professor Simpson and Dr. Houston, in which they concluded that the system had failed to produce the results guaranteed by the contractor, and in which they embodied their recommendations for further treatment, a local committee was appointed for the purpose of carrying out certain experiments in connection with the desired purification. The findings of the committee were submitted in December, 1918, and the members were unanimously of the opinion that the results of the experiments undertaken by them "demonstrated that the Excess Lime Process was capable of freeing the water supplied to Accra from bacillus Coli and rendering it epidemiologically safe whilst at the same time bringing it up to the standard required chemically and leaving little to be desired from the point of view of taste and visibility."

Weekly bacteriological examinations of samples from the final filters and from a standpipe or fountain in the town were instituted, and the results remain uniformly good.

Unfortunately it has not been found possible to pursue the experiments in relation to the Secondee supply, and this cannot be effectively done until the personnel and equipment for complete bacteriological control of the experiments are available in Secondee itself.

*Segregation Areas.*—The recognition of the principle of segregation by others than the Sanitarian and those who have benefited by it is a slow growth, but during the year four new buildings for non-officials were started in the reserve at Accra.

The question is whether segregation of Europeans from natives should not be made compulsory, and it may be that we are not fulfilling our legal obligations in not insisting that it should be so. Apart from the minor details of comfort segregation may conceivably spell the difference between life and death to many a resident on the Coast.

The adoption of complete segregation does not mean that the requirements of the Native Area will be neglected ; improvement will go on *pari passu*, but it means that the chances of one section of the community of developing diseases to which they are peculiarly liable will be reduced to a minimum, if not entirely disposed of.

## B.—MEASURES TO SPREAD THE KNOWLEDGE OF HYGIENE AND SANITATION.

The seed that to all appearances was being sown on stony ground is now beginning to show fruit : Education in hygiene and simple sanitation is part of the curriculum of the schools, and the knowledge which at least the more intelligent of the applicants for posts as sanitary inspectors possess on presenting themselves for possible employment is creditable to the teaching. They are tested upon their knowledge of the simpler facts about health and disease before their applications are sent forward.

It was very gratifying during the year to receive a letter from a scoutmaster in a town on the Akwampong Range requesting to be supplied with sanitary rules and instructions for use in the boys' clubroom as a guide to better health and also for the use of the public. Several circulars were drawn up and sent to him. These were acknowledged and appreciation shown by a further application on the outbreak of the epidemic of influenza for rules for their guidance against that particular disease.

### C.—RECOMMENDATIONS FOR FUTURE WORK.

Before the war the amount of sanitary improvements that was undertaken increased from year to year, and local schemes were being mooted, discussed and adopted as found expedient. It is hoped that a gradual resumption of work upon the scale that then prevailed may now be possible.

Extension of drainage systems, introduction of sewerage systems in the larger towns and formation of water supplies, constitute bases of work which will continually open up in new channels.

The causation of ankylostomiasis in the towns and villages along the littoral and the means of its prevention form subjects for special and early investigation.

The increase of tuberculosis also requires special attention and the formation of cliniques and sanatoria should be considered.

The swamp which exists along the upper reaches of the lagoon and the Railway Valley in Accra is a very prolific breeding ground for mosquitoes, and from its extent and conformation is practically beyond control.

The reclamation of this large area on a comprehensive scheme is an important and urgent problem. The initial outlay of capital will undoubtedly be large but the reclaimed land will, after it has been consolidated and been properly laid out, be very valuable indeed for commercial and residential purposes, while the insistent interests of the conservation of public health will be more completely met.

J. B. ALEXANDER,

*Acting Senior Sanitary Officer.*

ACCRA,

1st May, 1919.

### IV.—METEOROLOGY.

17. The rainfall, which in 1916 and 1917 was above the average, fell to its normal figure during the year :—

RAINFALL IN INCHES.

Station.						1916.	1917.	1918.
Accra ...	...	...	...	...	...	41·05	44·20	32·37
Aburi ...	...	...	...	...	...	48·66	73·16	42·24
Cape Coast ...	...	...	...	...	...	53·62	56·25	35·30
Secondee ...	...	...	...	...	...	37·67	56·76	34·53
Axim ...	...	...	...	...	...	110·45	94·50	47·64
Tarquah ...	...	...	...	...	...	77·08	92·62	53·80
Coomassie ...	...	...	...	...	...	60·79	71·40	58·64
Tamale ...	...	...	...	...	...	45·52	35·76	44·45

## V.—HOSPITALS AND DISPENSARIES.

18. Owing to the financial situation no start has yet been made with the scheme for native dispensaries alluded to in last year's Report.

Although the Medical Staff was much depleted, no less than 58,666 natives received medical treatment at the various Government hospitals and dispensaries, and this I submit affords material evidence of the extent to which the services of the West African Medical Staff are appreciated by the native population, and when one remembers that the total European population of the Colony only amounted to 1,823, no less than 578 of whom are employed by mining companies and are attended by their own medical men, it is evident that the bulk of the work done by members of the West African Medical Staff is in connection with the needs of the native population.

## PRISONS.

19. The general health of the prisoners was satisfactory, although owing to the outbreak of influenza the death-rate rose from 4·13 per 1,000 in 1917 to 11·2 per 1,000.

		1916.	1917.	1918.
Total convicts ...	...     ...	6,169	6,525	6,694
Total sick ...	...     ...	527	990	1,391
Total deaths ...	...     ...	26	27	85

## VI.—SCIENTIFIC.

20. The report of the Acting Pathologist, which is attached as an appendix, constitutes a careful record of work carried out during the year under adverse conditions occasioned by the shortage of staff.

I hope that when our strength returns to normal more assistance will be available for the Laboratory and that the Sanitation Branch will be able to take over the routine work in connection with water analysis, but this cannot be done at present as the staff of the Sanitation Branch in Accra instead of consisting, as normally, of a Senior Sanitary Officer, a Junior Sanitary Officer and a Medical Officer of Health, consists only of an Acting Senior Sanitary Officer performing also the duties of the Junior Sanitary Officer and the Medical Officer of Health.

Dr. Ingram's observations with regard to finding in the sputa of a case of influenza (and previously in other cases) of a gram negative bacillus resembling *B. pestis* morphologically are of especial interest in connection with the supposed outbreak of plague in Axim in December, 1917.

THOS. E. RICE,

11th May, 1919.

*Principal Medical Officer.*

## TABLE IV.

## 1.—NAME OF TOWN.

Station.	1917.			1918.		
	Approximate Area.	No. of proclaimed open spaces.	Approximate Area.	No. of proclaimed open spaces.		
Accra ... ... ...	4½ sq. miles	26	4½ sq. miles	26		
Cape Coast ... ... ...	2½ sq. miles	3	2½ sq. miles	4		
Secondee ... ... ...	3 sq. miles	3	3 sq. miles	3		
Coomassie ... ... ...	9 sq. miles	—	9 sq. miles	—		

## 2.—POPULATION.

Station.	1917.					1918.				
	Natives.		Europeans.		Total.	Natives.		Europeans.		Total.
	Males.	Females.	Males.	Females.		Males.	Females.	Males.	Females.	
Accra ...	14,000	11,000	200	25	25,225	13,000	10,250	180	20	23,450
Cape Coast ...	5,188	5,620	35	8	10,851	5,010	5,502	37	7	10,556
Secondee ...	7,396	4,096	97	9	11,598	6,279	6,744	140	6	13,169
Coomassie ...	13,045	17,022	106	6	30,179	13,030	17,020	132	3	30,185

## 3.—HOUSING.

Station.	1917.				1918.			
	Houses.		Huts.		Houses.		Huts.	
	Europeans.	Natives.	Europeans.	Natives.	Europeans.	Natives.	Europeans.	Natives.
Accra ...	142	2,750	See Houses.	—	145	2,901	See Houses.	—
Cape Coast ...	21	1,317	—	318	22	1,320	—	321
Secondee ...	89	1,257	—	—	132	1,230	—	—
Coomassie ...	46	2,721	—	763	46	2,754	—	762

## 4.—MOSQUITO PROTECTION OF HOUSES.

Station.	1917.				1918.			
	Number of houses wholly protected.	Number of houses with Mosquito-proof room.	Made wholly protected in 1917.	Partially protected in 1917.	Number of houses wholly protected.	Number of houses with Mosquito-proof room.	Made wholly protected in 1918.	Partially protected in 1918.
Accra ...	—	35	—	—	—	20	—	—
Cape Coast ...	—	4	—	—	—	4	—	—
Secondee ...	—	22	—	—	—	22	—	—
Coomassie ...	—	16	—	2	—	16	—	—

TABLE IV.—*continued.*

## 5 (A).—ERECTION OF NEW BUILDINGS DURING THE YEAR.

Station.	1917.					1918.				
	Public Buildings with full sanction.	Houses with full sanction.	Huts with full sanction.	Houses without sanction.	Huts without sanction.	Public Buildings with full sanction.	Houses with full sanction.	Huts with full sanction.	Houses without sanction.	Huts without sanction.
Accra ...	—	232	9	—	510	—	151	—	15	40
Cape Coast ...	3	—	2	—	—	—	—	—	—	—
Secondee ...	1	22	—	—	—	—	28	—	—	—
Coomassie ...	—	57	—	2	—	4	33	—	—	—

## 5 (B).—ACTION TAKEN.

Station.	1917.				1918.			
	Number of prosecutions.		Number demolished.		Number of prosecutions.		Number demolished.	
	Huts.	Houses.	Huts.	Houses.	Huts.	Houses.	Huts.	Houses.
Accra ...	—	—	366	7	—	—	94	—
Cape Coast ...	—	3	—	—	—	2	—	1
Secondee ...	—	—	—	49	—	—	12	—
Coomassie ...	—	—	4	9	—	—	1	1

## 6.—MARKETS.

Station.	1917.			1918.		
	Number.	Paved and drained.	Unpaved.	Number.	Paved and Drained.	Unpaved.
Accra ...	2	2	—	2	2	—
Cape Coast ...	1	1	—	2	—	2
Secondee ...	2	2	—	4	3	1
Coomassie ...	2	1 & 1 partly	—	3	1	2

## 7.—SLAUGHTER HOUSES.

Station.	1917.			1918.		
	Number.	Paved and Drained.	Unpaved.	Number.	Paved and Drained.	Unpaved.
Accra ...	1	1	—	1	1	—
Cape Coast ...	1	1	—	1	1	—
Secondee ...	2	2	—	2	2	—
Coomassie ...	2	2	—	2	2	—

TABLE IV.—*continued.*

## 8. LATRINES.

1917. 1918.

Station.	Number.				New Ones.				Repaired.				Demolished.				Number.				New Ones.				Repaired.				Demolished.			
	Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.	
	Num. Seats Number.																															
Accra ...	38	449	36	226	2	24	2	24	7	56	7	56	7	56	—	—	40	473	40	250	—	250	—	—	—	—	—	—	—	—	—	
Cape Coast ...	11	144	9	144	—	—	—	—	5	—	5	—	—	—	—	—	11	144	9	144	1	144	1	6	1	6	1	—	—	—	—	
Secondee ...	12	119	8	64	—	—	—	—	5	53	4	43	1	12	—	—	—	11	196	2	196	2	196	2	—	—	—	—	—	—	—	—
Coomassie ...	30	262	28	257	3	18	3	18	—	—	—	—	—	—	—	—	30	262	28	257	—	257	—	—	—	—	—	—	—	—	34	

## 8. LATRINES (PRIVATE).

Station.	Pails Number.	No. of clean pails substituted for dirty ones.	No. of nightsoil men.	Cesspools cleansed.	Cesspools abolished.	Cesspools regularly oiled.	1917.				1918.			
							Pails removed daily.	No. of clean pails substituted for dirty ones.	No. of nightsoil men.	Cesspools cleaned.	Pails removed daily.	No. of clean pails substituted for dirty ones.	No. of nightsoil men.	Cesspools abolished.
	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.
Accra ...	262	615	57	—	—	—	—	—	—	—	280	602	38	54
Cape Coast ...	95	863	5	30	10	—	—	—	—	—	89	817	3	29
Secondee ...	160	189	389	31	—	—	—	—	—	—	207	199	31	10
Coomassie ...	102	399	200	60	—	—	—	—	—	—	173	391	64	2

TABLE IV.—*continued.*

REMOVAL OF REFUSE.

STATION.	1917.			1918.		
	Dustbins.	Carts removing street refuse.	Amount of refuse removed daily from streets.	Dustbins.	Carts removing street refuse.	Amount of refuse removed daily from streets.
Accra ...	39	13	80	41	12	95
Cape Coast ...	39	11	67 cart-loads	39	1	67 cart-loads
Seccondee ...	20	9	28 cart-loads	19	—	*23 cart-loads
Coomassie ...	...	—	85½ head-loads	—	2	163 head-loads
			20 wheel-barrows and 1 cart		2	109 head-loads
					51 baskets	25
						Men employed.
						40
						31
						31
						25
						40
						31
						31
						25
						25

## 10. MODE OF DISPOSAL OF EXCRETA, REFUSE AND OFFAL.

TABLE IV.—*continued.*

**III.—AVERAGE DAILY NUMBER OF CARTLOADS OF CANS, BOTTLES AND INCOMBUSTIBLE MATERIAL REMOVED FROM HOUSES AND COMPOUNDS.**

STATION.	1917.	1918.
Accra	...	...
Cape Coast	...	...
Seccondee	...	...
Coomassie	...	...
	25	44
	1	1
	2	2
	73·9	83 head-loads.

## 12.—WATER SUPPLY.

TABLE IV.—*continued.*

## 13.—DRAINAGE. (PUBLIC).

Station.	1917				1918				Earth Drains.			
	Masonry Drains.											
	Lineal Yards	Lineal Yards Reconstructed	Lineal Yards Repaired	Lineal Yards Constructed	Lineal Yards Reconstructed	Lineal Yards Repaired	Lineal Yards Constructed	Lineal Yards Cleared	Frequency of Cleaning	Lineal Yards Dug	Frequency of Cleaning	
Accra	... ... ...	34,516	—	2,345	34,516	—	—	—	Every 2 months.	485	Every 2 months.	
Cape Coast	... ... ..	18,913	12	6	172	18,913	835	—	Continuously.	—	—	
Secondee	... ... ..	18,843	—	125	953	20,000	356	250	Twice in a quarter.	3,282	Twice in a quarter.	
Coomassie	... ... ..	7,770	—	—	—	7,847	—	157	Twice in a quarter.	1,328	Twice in a quarter.	
								77	4 times monthly.	1,589	4 times monthly.	
								19,070	37	1,500	37	

## 14.—CLEARANCE OF UNDERGROWTH, GRASS, WEEDS, &amp;c.

Station.	1917.		1918.	
	Square Yards Grass, &c., cut and removed.	Frequency of Clearance.	Square Yards Grass, &c., cut and removed.	Frequency of Clearance.
Accra	... ... ..	2,878,518	4,541,527	Four times a year.
Cape Coast	... ... ..	361,931	196,756	Continuously.
Secondee	... ... ..	583,618	588,626	Quarterly.
Coomassie	... ... ..	2,491,504	2,437,310	Every six weeks.

TABLE IV.—*continued.*

## 15.—EXCAVATIONS AND LOW-LYING LAND.

16. OILING.

Station.	Drains oiled.	Pools and excavations oiled.	Tanks and barrels oiled.	Men employed daily for oiling.		Men employed daily for oiling.
				Drains oiled.	Pools and excavations oiled.	
Accra ...	967	3,208	2,441	4	7,276	17,032
Aape Coast ...	285	747	261	4	270	245
Econdee ...	155	266	69	5	155	120
Koomassie ...	7,972	8,195	—	4	2,269	2,146
						—
						3
						4
						5
						4

TABLE IV.—*continued.*

Station.	Inspectors Employed.	Houses Inspected.	Houses where Larvae were found.	Notices against Larva.	Persons fined for Larvae.	Notices re Insanitary Conditions.	No. of Soda and Aerated Factories Inspected.	Inspectors Employed.	Houses Inspected.	Houses where Larvae were found.	Notices against Larva.	Persons fined for Larvae.	Notices re Insanitary Conditions.	No. of Soda and Aerated Factories Inspected.	Inspectors Employed.	Houses Inspected.	Houses where Larvae were found.	Notices against Larva.	Persons fined for Larvae.	Notices re Insanitary Conditions.	No. of Soda and Aerated Factories Inspected.		
Accra	...	12	80,112	507	278	449	634	—	—	14	94,625	672	331	480	755	—	—	—	—	—	—	—	
Cape Coast	...	12	26,428	410	309	425	94	3	—	12	28,675	533	242	359	37	21	—	—	—	—	—	—	
Secondee	...	10	66,596	401	804	322	489	118	1	9	61,098	561	722	440	343	106	—	—	—	—	—	—	
Coomassie	...	6	30,248	306	138	247	281	2,789	1	4	25,100	282	62	212	180	1,696	1	—	—	—	—	—	

TABLE V.  
RETURN OF DISEASES AND DEATHS (IN AND OUT-PATIENTS)  
FOR THE YEAR 1918.

Disease.	Remaining in Hospital at end of 1917.	Yearly Total.		Total Cases treated.	Remaining in Hospital at end of 1918.	Remarks.
		New Cases.	Deaths.			
<b>INFECTIVE DISEASES.</b>						
Beri-Beri ... ...	—	6	1	6	—	
Chicken-Pox ... ...	7	575	—	582	5	
Dengue ... ...	—	3	—	3	—	
Dysentery { Amœbic ...	—	16	—	16	—	
Unallocated	4	396	15	400	3	
Endocarditis--infective...	—	1	1	1	—	
Enteric ... ...	—	6	—	6	—	
Erysipelas ... ...	—	1	—	1	—	
Gonorrhœa ... ...	2	1,196	1	1,198	4	
Influenza ... ...	—	7,756	204	7,756	8	
Leprosy—						
(a) Nodular ... ...	3	15	1	18	3	
(b) Anæsthetic ...	1	—	—	1	—	
Malaria—						
(a) Tertian ... ...	—	825	—	825	—	
(b) Quartan ... ...	—	84	—	84	—	
(c) Aestivo-Autumnal	1	353	5	354	6	
(d) Chronic Malaria	3	64	—	67	—	
(e) Blackwater ...	—	17	4	17	1	
(f) Unallocated ...	9	1,825	4	1,834	1	
Malta Fever ... ...	—	9	—	9	—	
Measles ... ...	2	78	—	80	—	
Pneumonia ... ...	—	356	67	356	1	
Rheumatic Fever ...	—	9	1	9	—	
Septicæmia ... ...	—	29	6	29	—	
Trypanosomiasis (Sleeping Sickness) ... ...	—	10	—	10	—	
Small-Pox ... ...	—	5	—	5	—	
Syphilis—						
(a) Primary ... ...	—	69	—	69	1	
(b) Secondary ...	3	319	4	322	2	
(c) Inherited... ...	—	28	—	28	—	
Tetanus ... ...	—	26	1	26	—	
Tuberculosis ... ...	3	236	33	239	—	
Whooping Cough ...	—	120	—	120	—	
Yaws ... ...	—	440	1	440	1	
Yellow Fever ... ...	—	3	—	3	—	
Pyrexia, unknown origin	1	984	1	985	6	
Other Diseases ... ...	—	64	—	64	—	
<b>INTOXICATIONS.</b>						
Alcoholism ... ...	—	25	—	25	—	
Others ... ...	—	3	—	3	—	
<b>GENERAL DISEASES.</b>						
Anæmia ... ...	—	232	—	232	2	
Diabetes... ...	—	1	—	1	—	
Exophthalmic Goitre ...	—	2	—	2	—	

Disease.	Remaining in Hospital at end of 1917.	Yearly Total.		Total Cases treated.	Remaining in Hospital at end of 1918.	Remarks.
		New Cases.	Deaths.			
<b>GENERAL DISEASES— contd.</b>						
Gout ... ...	—	4	—	4	—	
Rickets ... ...	—	2	—	2	—	
Chronic Rheumatism ...	3	969	1	972	1	
Debility ... ...	1	129	1	130	—	
Other Diseases ... ...	1	291	1	292	4	
<b>LOCAL DISEASES.</b>						
Diseases of the Nervous System:—						
Sub-section 1.						
Neuritis ... ...	—	76	—	76	—	
Meningitis ... ...	—	17	9	17	—	
Myelitis ... ...	—	2	—	2	—	
Congestion of Brain	—	1	—	1	—	
Other Diseases ... ...	—	27	4	27	—	
Sub-section 2.						
Apoplexy ... ...	—	5	3	5	—	
Paralysis ... ...	6	46	7	52	1	
Epilepsy ... ...	—	36	—	36	—	
Neuralgia ... ...	—	302	—	302	—	
Hysteria ... ...	—	12	—	12	—	
Other Diseases ... ...	—	147	—	147	—	
Sub-section 3.						
Mental Diseases:—						
Mania ... ...	—	5	—	5	1	
Melancholia ...	—	2	—	2	—	
Dementia ... ...	1	3	—	4	—	
Delusional Insanity	—	6	—	6	—	
Other Diseases ... ...	—	9	—	9	—	
Diseases of the Eye:—						
Conjunctivitis ...	—	1,523	—	1,523	—	
Keratitis ... ...	—	46	—	46	—	
Ulceration of Cornea	—	51	—	51	—	
Iritis ... ...	1	56	—	57	—	
Optic Neuritis ...	—	8	—	8	—	
Cataract ... ...	—	35	—	35	—	
Other Diseases ... ...	—	165	—	165	1	
Diseases of the Ear:—						
Inflammation ...	—	671	—	671	—	
Other Diseases ...	—	354	—	354	—	
Diseases of the Nose ...						
Diseases of the Circulatory System:—						
Pericarditis ...	—	24	2	24	—	
Endocarditis ...	—	3	—	3	—	
Valvular Mitral ...	—	71	3	71	—	
„ Aortic ...	—	15	—	15	—	
„ Tricuspid	—	1	—	1	—	
Arterial Sclerosis ...	—	3	—	3	—	
Aneurism ... ...	1	3	—	4	—	
Other Diseases ... ...	3	94	10	97	—	

Disease.	Remaining in Hospital at end of 1917.	Yearly Total.		Total Cases treated.	Remaining in Hospital at end of 1918.	Remarks.				
		New Cases.	Deaths.							
<b>LOCAL DISEASES—contd.</b>										
<b>Diseases of the Respiratory System :—</b>										
Laryngitis ...	—	227	1	227	—					
Bronchitis ...	—	3,161	5	3,161	5					
Broncho-Pneumonia	—	210	4	210	1					
Abscess of Lung ...	—	3	2	3	—					
Pleurisy ...	—	301	3	301	5					
Empyema ...	—	2	1	2	—					
Other Diseases ...	—	720	1	720	—					
<b>Diseases of the Digestive System :—</b>										
Stomatitis ...	—	522	—	522	—					
Caries of Teeth ...	—	794	—	794	—					
Glossitis ...	—	123	—	123	—					
Sore Throat ...	—	69	1	69	—					
Inflammation of Tonsils ...	—	241	—	241	—					
Gastritis ...	2	261	—	263	—					
Ulceration of Stomach	—	29	1	29	—					
Hæmatemesis ...	—	7	1	7	—					
Dyspepsia ...	—	637	—	637	1					
Enteritis ...	—	173	2	173	—					
Appendicitis ...	—	10	—	10	—					
Colitis ...	—	26	—	26	—					
Ulceration of Intestines	—	2	—	2	—					
Hernia ...	2	181	4	183	—					
Diarrhoea ...	—	1,299	5	1,299	2					
Constipation ...	—	4,307	—	4,307	—					
Colic ...	—	525	1	525	—					
Hæmorrhoids ...	1	179	—	180	—					
Hepatitis—Acute ...	—	59	2	59	—					
Abcess ...	—	25	6	25	—					
Cirrhosis ...	1	10	1	11	1					
Jaundice ...	2	47	1	49	—					
Peritonitis ...	—	21	7	21	—					
Ascites ...	2	22	4	24	—					
Other Diseases ...	—	245	8	245	4					
<b>Diseases of the Lymphatic System :—</b>										
Splenitis ...	—	203	—	203	—					
Inflammation of Lymphatic Gland	4	189	1	193	—					
Suppuration of Lymphatic Gland ...	—	181	—	181	1					
Lymphangitis ...	—	35	—	35	—					
Elephantiasis ...	2	13	—	15	—					
Other Diseases ...	—	61	—	61	—					
<b>Diseases of the Urinary System :—</b>										
Acute Nephritis ...	1	53	9	54	1					
Bright's Disease ...	—	35	3	35	—					
Pyelitis ...	—	1	—	1	1					
Calculus ...	—	3	—	3	—					
Renal Colic ...	—	6	—	6	—					
Cystitis ...	—	103	3	103	1					
Vesical Calculus ...	—	1	—	1	—					
Suppression ...	—	1	—	1	—					
Hæmaturia... ...	—	31	—	31	—					
Other Diseases ...	1	18	1	19	—					

Disease.	Remaining in Hospital at end of 1917.	Yearly Total.		Total Cases treated.	Remaining in Hospital at end of 1918	Remarks.				
		New Cases.	Deaths.							
<b>LOCAL DISEASES—contd.</b>										
<b>Diseases of the Generative System :—</b>										
(Male Organs) :										
Urethritis ...	...	—	415	—	415	—				
Gleet ...	...	—	16	—	16	—				
Stricture ...	...	—	84	—	84	—				
Prostatitis ...	...	—	4	—	4	—				
Soft Chancre ...	...	3	250	—	253	4				
Condyloma ...	...	—	9	—	9	—				
Inflammation of Scrotum ...	...	—	8	—	8	—				
Hydrocele ...	...	—	78	—	78	—				
Orchitis ...	...	—	306	—	306	—				
Epididymitis ...	...	—	33	—	33	—				
Abscess of Testicle	—	—	6	—	6	—				
Other Diseases ...	...	4	156	1	160	3				
(Female Organs) :										
Ovaritis ...	...	—	6	—	6	—				
Ovarian Cyst ...	...	—	3	—	3	—				
Endometritis ...	...	—	47	—	47	—				
Displacement of Uterus ...	...	1	9	—	10	—				
Vaginitis ...	...	—	31	—	31	1				
Amenorrhœa ...	...	1	61	—	62	—				
Dysmenorrhœa ...	...	—	96	—	96	—				
Menorrhagia ...	...	—	29	—	29	—				
Leucorrhœa ...	...	—	27	—	27	—				
Abortion ...	...	—	19	—	19	—				
Delayed Labour ...	—	—	9	1	9	—				
Postpartum Hæmorrhage ...	...	—	2	—	2	—				
Premature Birth ...	—	—	3	1	3	—				
Puerperal Septicæmia	—	—	2	—	2	—				
Mastitis ...	...	—	19	—	19	1				
Abscess of Breast ...	—	—	25	—	25	—				
Other Diseases ...	...	1	67	1	68	1				
<b>Diseases of Organs of Locomotion :—</b>										
Osteitis ...	...	—	64	—	64	—				
Arthritis ...	...	1	143	—	141	1				
Bursitis ...	...	—	49	—	49	—				
Other Diseases ...	...	3	1,303	2	1,306	4				
<b>Diseases of Connective Tissue :—</b>										
Cellulitis ...	...	2	570	3	572	1				
Abscess ...	...	1	805	5	806	4				
Elephantiasis ...	—	—	3	—	3	—				
Other Diseases ...	...	1	144	—	145	—				

Disease.	Remaining in Hospital at end of 1917.	Yearly Total.		Total Cases treated.	Remaining in Hospital at end of 1918.	Remarks.				
		New Cases.	Deaths.							
<b>LOCAL DISEASES—contd.</b>										
Diseases of the Skin :—										
Urticaria ... ...	—	70	—	70	—					
Eczema ... ...	—	302	—	302	1					
Boil... ... ...	—	562	—	562	—					
Carbuncle ... ...	—	16	—	16	—					
Herpes ... ...	—	79	—	79	1					
Psoriasis ... ...	—	29	—	29	—					
Tinea ... ...	—	546	—	546	—					
Scabies ... ...	—	403	—	403	—					
Acne ... ...	—	28	—	28	—					
Prickly Heat ...	—	183	—	183	—					
Ulcers ... ...	55	4,968	2	5,023	30					
Other Diseases ...	2	736	—	738	—					
Injuries :—										
General ... ...	5	284	10	289	1					
Local ... ...	60	5,809	21	5,869	38					
Surgical Operations ...										
Major ... ...	—	309	—	309	Not included in totals.					
Minor ... ...	—	188	—	188						
Tumours... ... ...	1	132	2	133	—					
Malformations ... ...	—	12	—	12	—					
Poisons ... ... ...	—	38	2	38	—					
Parasites—Animal :—										
Protozoa ... ...	—	32	—	32	—					
Trematoda (Flukes)	—	1	—	1	—					
Bilharzia ...	—	12	—	12	—					
Cestoda :—										
Tænia Solium ...	—	397	—	397	—					
Tænia Saginata ...	—	115	—	115	—					
Nematoda :—										
Ascaris ... ...	—	297	—	297	—					
Tricocephalus Dispar	—	1	—	1	—					
Dracunculus ...	4	1,200	—	1,204	5					
Filariasis ... ...	—	6	—	6	—					
Ankylostomiasis ...	1	91	4	92	—					
Oxyuris ... ...	—	11	—	11	—					
Other Diseases ...	—	51	—	51	—					
Insecta :—										
Chiggæs ... ...	2	98	—	100	1					
Other Diseases ...	—	18	—	18	—					
<b>TOTAL ...</b>	<b>222</b>	<b>58,444</b>	<b>524</b>	<b>58,666</b>	<b>174</b>					

## APPENDIX A.

## ROUTINE EXAMINATIONS.

## I.—Blood Examinations.

## II.—Examinations of Fleas.

Europeans 33 ... Natives 150 = 183

### III.—*Examinations of Urines.*

#### IV.—Examinations of Sputum.

Europeans 8 ... Natives 51 = 59

### V.—Examinations of Smears of Pus, etc.

Europeans 22 ... Natives 55 = 77

## VI.—*Miscellaneous Examinations.*

## VII.—*Post-mortem Examinations.*

Europeans 2 ... Natives 50 = 52

## VIII.—*Examinations of various Animals.*

ROUTINE EXAMINATIONS.—*continued.*IX.—*Examinations of Mosquito Larva.*

Jan., 48 ; Feb., 46 ; March, 84 ; April, 78 ; May, 90 ; June, 71 =	417
July, 64 ; Aug. 20, ; Sept., 27 ; Oct., 30 ; Nov., 63 ; Dec., 41 =	245
	<hr/> 662 <hr/>

X.—*Water Analysis*

Chemical ... ... ... ... ... ... ...	1
Bacteriological cultures ... ... ... ... ...	807
	<hr/> 808 <hr/>

## INTRODUCTION.

The work carried on in the Laboratory during the year was mainly of a routine nature. The continued absence from the Colony of the Pathologist and the various extra duties devolving upon the Acting Pathologist owing to shortage of staff have prevented any attempt at special work.

The actual number of pathological specimens examined falls short of those examined in 1917 by 228 and of those examined in 1916 by 231 ; this is attributable to two facts (1) the outbreak of influenza (2) the work undertaken in connection with the excess lime treatment of the Accra water supply.

The epidemic of influenza, while it lasted, kept the Senior Medical Officer and the Medical Officers in charge of the Hospitals, Gaol, Asylum and Cantonments so busy that, they were unable to forward specimens for examinations, whilst the bacteriological examination of water samples occupied much of the time of the Acting Pathologist—time that might have been devoted to work more essentially his own. It is to be hoped, as the bacteriological examination of water samples is really public health work, that in the near future the Sanitary Department will depute one of its staff, to whom the experience would be beneficial, to undertake this duty.

Dr. Watt was in charge of the Laboratory from April 11th to August 25th. Dr. Fraser worked in the Laboratory from November 14th to the end of the year.

Through the kindness of Dr. Watt the records of examinations made when he was in charge of the Laboratory are included in this report.

## I.—BLOOD EXAMINATIONS.

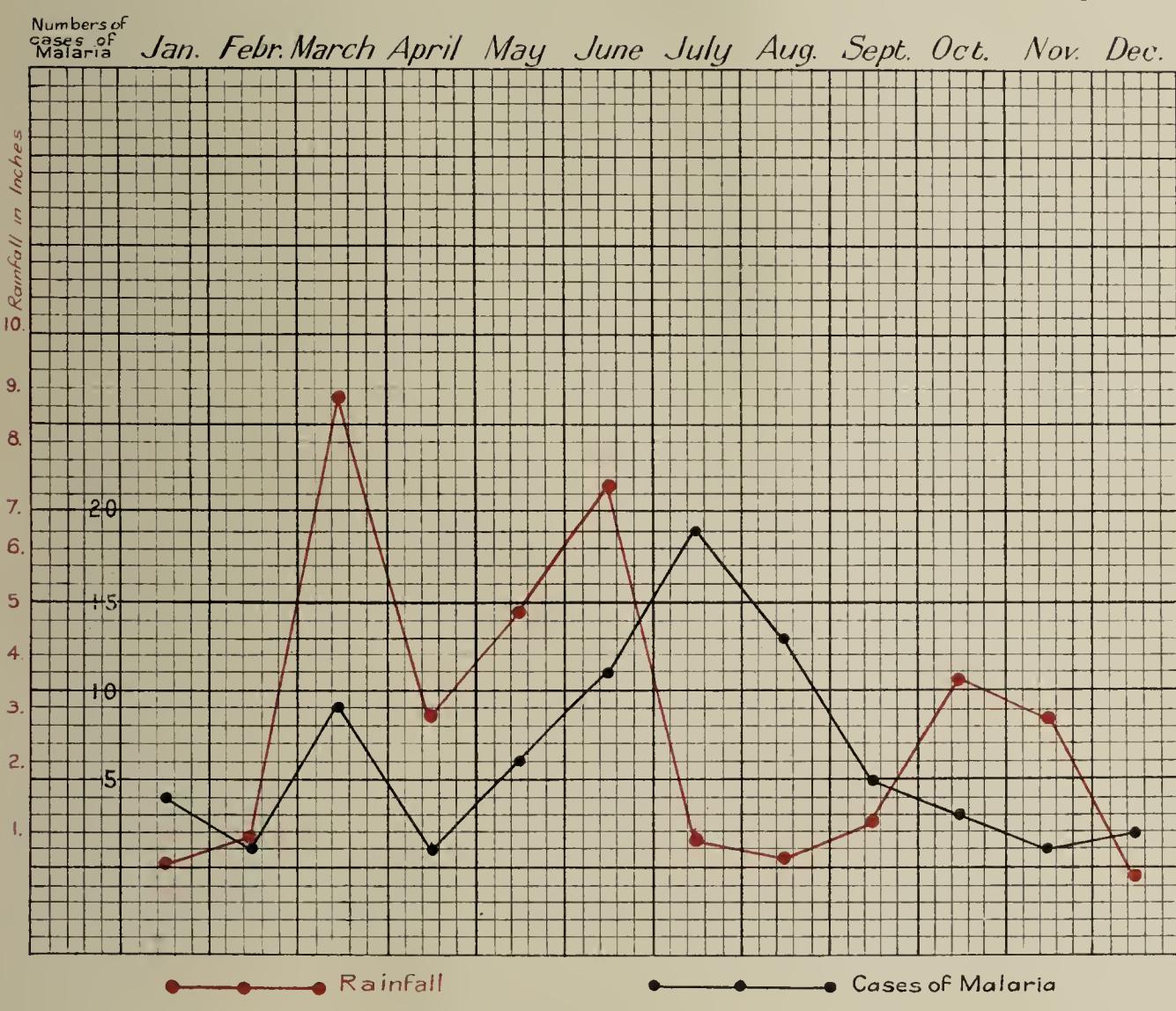
The number of examinations of blood made was 344 as compared with 686 in 1917, and 705 in 1916. Of these examinations 291 were for malarial parasites, 3 for trypanosomes and 6 for microfilariae. 28 differential counts and 9 Arneth counts were done. An enumeration of the blood cells was made in the case of two Europeans, the Widal reaction was carried out twice and the Wassermann test upon three occasions.

232 of these examinations were in cases of Europeans, 112 in cases of natives.

Malarial parasites were found in 62 European cases and in 13 native cases. In the Europeans *p. vivax* was found 33 times, *p. falciparum* 27 times and *p. malariae* twice. In the natives *p. falciparum* occurred ten times and *p. vivax* thrice. One of the cases of *p. malariae* amongst the Europeans was associated with *p. vivax*. There was no double infection in the native cases. In the absence of parasites pigmented leucocytes were found on seven occasions in Europeans and on one occasion in a native.

Crescents were only seen in one case, that of a native child. Very amoeboid forms of parasites (*p. tenuis*) were seen several times, anaplasma were seen on many occasions and parasites with faintly staining cytoplasm were found twice in Europeans. It is possible that this defective staining of the cytoplasm is the result of the administration of quinine, as parasites may be found to stain normally in the blood of a patient one day and to show defective staining—with Leishman's or Giemasa's stains—the following day after the administration of quinine.

Rainfall in inches and incidence of Malaria in ACCRA during 1918





The large incidence of Benign Tertian is to be noted when comparing the returns for 1918 with those of 1917, 1916, 1915 and 1914. Whether this is due to infection with Benign Tertian parasites conveyed from East Africa by returning troops or to the personal equation of the observer remains to be proved by future observation.

TABLE I.—EXAMINATIONS FOR EVIDENCE OF MALARIAL INFECTION.

Host.	<i>P. falciparum.</i>	<i>P. malariae.</i>	<i>P. vivax.</i>	Pigmented Leucocytes.
Europeans ... ...	27	2	33	7
Natives ... ...	10	-	3	1
Totals ... ...	37	2	36	8

The monthly incidence of cases of malaria in relation to the rainfall is given in the accompanying chart. It will be seen to follow the rainfall closely.

The differential leucocyte counts made were so few as to be scarcely worth mentioning except that a relative lymphocytosis in certain febrile cases at the time of the outbreak of influenza suggested influenza and not malaria as the cause of the rise of temperature.

The Arneth counts were done in cases of influenza and though few in number indicated a pronounced 'shift to the left' in that disease.

Both Widal reactions were negative as regards *b. typhosus*, Para 'A' and Para 'B.' Two of the Wassermann tests proved negative. Microfilariae (*m. bancrofti*) were found in two of the cases of natives examined. No trypanosomes were found in the three blood films submitted for examination.

Blood films submitted for examination from a delirious febrile case showed many Gram negative bacilli. The case ended fatally before blood could be obtained for cultural purposes.

TABLE II.—INFECTIONS IDENTIFIED DURING THE EXAMINATIONS OF FÆCES.

Infections identified.	Europeans.	Natives.	Totals.
<i>E. histolytica</i> ... ... ... ...	8	42	50
<i>Trichomonas intestinalis</i> ... ... ...	—	21	21
<i>Giardia</i> ... ... ... ...	—	7	7
<i>Tetramitus mesnili</i> ... ... ... ...	—	3	3
<i>Blastocystis enterocola</i> ... ... ... ...	2	17	19
Spirochaetes ... ... ... ...	—	12	12
<i>Strongyloides stercoralis</i> ... ... ...	—	9	9
Ova of <i>Ascaris lumbricoides</i> ... ... ...	1	41	42
Ova of "Hook" worm ... ... ...	—	32	32
Ova of <i>Trichuris trichiura</i> ... ... ...	—	25	25
Ova of <i>Taenia saginata</i> ... ... ...	—	4	4

## II.—EXAMINATION OF FÆCES.

One hundred and eighty-three specimens of faeces were examined during the year ; of these 30 were from Europeans and 150 from natives. *E. histolytica* occurred in eight of the specimens from Europeans. Ova of *Ascaris lumbricoides* were found in one European's faeces and *Blastocystis enterocola* was noticed on two occasions.

Amongst the native cases *E. histolytica* was found in 42 of specimens, *Trichomonas intestinalis* in 21, *Giardia* (Lamblia) in 7, *Tetramitus mesnili* in 3 and *Blastocystis enterocola* in 17. Spirochaetes were seen on twelve occasions and *Strongyloides stercoralis* was observed 9 times. Ova of *Ascaris lumbricoides* appeared in 42 specimens, "Hook" worm ova in 32 specimens, ova of *Trichuris trichiura* in 25 specimens and ova of *Taenia saginata* in 4 specimens.

## III.—EXAMINATION OF URINE.

The urine was examined in 46 cases, namely in 16 Europeans and in 30 natives. In 27 specimens a chemical examination was made while 22 specimens were examined microscopically and 3 spectroscopically.

Ova of *Schistosoma haematosobium* were found in ten of the native cases ; spirochaetes occurred in two native cases. Haemoglobin was found in the urine of one European ; it was transient. In contrast to the cases examined in 1917, amoebæ were found only in two specimens of urine from a single case.

## IV.—EXAMINATION OF SPUTUM.

Sputum from 59 cases was examined, 8 of these were Europeans and 51 were natives. *B. tuberculosis* was found in the cases of seven natives ; it was not found in any of the specimens of sputum submitted from Europeans.

In 34 cases of influenza, namely 5 cases in Europeans and 29 in natives, sputum was sent in for examination. Cultures on blood agar and on "trypagar" (Matthews, Lancet Vol. II, 1918, p. 104) were made from 26 of these cases and a small Gram negative coccobacillus usually accompanied by pneumococci and occasionally by pneumococci and streptococci was grown 15 times. Spirochaetes were detected in four specimens of sputum ; one of these came from a European and the others from natives ; fusiform bacilli were also present in all so that the buccal cavity was probably the source of these spirochaetes.

## V.—EXAMINATIONS OF SMEARS OF PUS, ETC.

TABLE III.—EXAMINATIONS OF SMEARS OF PUS.

Materials examined.	Europeans.	Natives.	Totals.
Abscesses, discharge from	—	2	2
Buboës	—	2	2
Discharge from nose, throat, eye...	1	3	4
Glands, fluid from...	—	1	1
Lepromatous nodules	—	1	1
Peritoneal fluid	—	1	1
Rupia-like crusts	—	1	1
Skin scales, etc.	—	3	3
Tumour of hand	—	1	1
Ulcers, discharge from	10	3	13
Urethral discharge	11	12	23
Vaginal discharge...	—	22	22
Yaws	—	3	3

Seventy-seven specimens from various sources are included under this heading, namely, 23 specimens of urethral discharge, 22 specimens of vaginal discharge, 13 specimens of discharge from ulcers, 3 specimens of serum from yaws, 3 specimens of pus from boils, 2 specimens of pus from abscesses, 2 specimens of discharge from buboës, 2 specimens of nasal discharge and solitary specimens of fluid from an enlarged gland, from a lepromatous nodule, from the peritoneal cavity, from rupia-like crusts, from the eye, from the throat, and from a tumour of the hand.

22 of these specimens were from Europeans, 55 from natives. Gonococci were found in eight of the 11 specimens of urethral discharge from European cases and in eight of the 12 cases of urethral discharge from native cases.

*T. pallidum* was found in two out of nine cases of penile ulcers in Europeans.

Gonococci were found in 16 cases of vaginal discharge out of 22 examined.

*B. leprae* were found in the scrapings from a lepromatous nodule in one case but were absent from the nasal discharge in another case of supposed leprosy.

Serum from the edge of several rupia-like growths on the arms and back of a native soldier was repeatedly examined for treponemata or leishmania without success. *T. pertenue* was detected in the serum from the papules of one of the three cases of yaws examined.

## VI.—MISCELLANEOUS EXAMINATIONS.

Sections were made of the tissues of only twelve cases during the year; these were all of native origin. Yellow fever was diagnosed as the cause of death in three cases, namely, two occurring at Saltpond in November and December of 1917, and one occurring at Secondee in May, 1918. Microscopic examination of sections of the viscera appeared to prove the correctness of the diagnosis in each case.

The same fungus (*Nocardia*?) that was recorded in the Laboratory Report for 1917 as having been cultivated from skin scales in the cases of two Europeans and a native was again grown from skin scales scraped from an itchy patch upon the leg of a native.

Eight exhibits were sent in by the Police for examination. As the Laboratory is not equipped for chemical analysis, it was not possible to make a report on three of these, which consisted of drugs alleged to have been administered for the purpose of producing criminal abortion. In five instances knives, bits of wood, and articles of clothing showing stains were examined for mammalian blood; it was found in three instances.

Smears were made from the lungs and other viscera in eleven cases where death was ascribed to influenza.

Pneumococci were found in the smears from the lungs in every case, Gram positive cocci and streptococci occurred in three cases, a small Gram negative cocco-bacillus in two and a larger Gram negative bacillus exhibiting rounded ends and bipolar staining in a single case. In a smear from one of the lungs, sheathed and sharp-tailed microfilaria were found.

## VII.—POST-MORTEM EXAMINATIONS.

TABLE IV.

Cause of Death.	Number of cases examined.	Cause of Death.	Number of cases examined.
Abcess of lung ... ...	1	Brought forward ... ...	26
Broncho-pneumonia ...	12	Heart disease ... ...	4
Compression (Middle Meningeal haemorrhage) ... ...	1	Marasmus ... ...	1
Drowning ... ...	3	Meningitis (septic) ...	1
Fracture of skull ... ...	2	Nephritis ... ...	1
" spine ... ...	2	Peritonitis (septic) ...	1
Gunshot wounds ...	3	Phthisis ... ...	2
Hæmorrhage (cut throat) ...	1	Pleurisy (with effusion) ...	2
Hanging (suicidal) ...	1	Pneumonia ... ...	11
<i>Carried forward</i> ... ...	26	Strangulation ... ...	2
		Tuberculosis, acute ...	1
		<b>TOTAL</b> ... ...	<b>52</b>

During the year 52 post-mortem examinations were made, two of the bodies of Europeans, fifty of the bodies of natives. The cause of death in the European was found to be fracture of the base of the skull and fracture of the cervical vertebrae in one case, fracture of the vault of the skull with subsequent meningitis and encephalitis in the other. Collisions between motor cycles and motor cars brought about the fatal result in both cases.

The fifty autopsies of natives are scarcely deserving of notice except to direct attention to the large proportion of deaths from pulmonary diseases. More than one half of the deaths were caused by diseases of the chest, namely, broncho-pneumonia 12, croupous pneumonia 11, phthisis 2, pleurisy with effusion 2, abcess of the lung 1. For this increase in deaths due to pulmonary diseases the epidemic of influenza was undoubtedly responsible.

In two of the bodies examined death was self inflicted. In one it was caused by hanging, in the other by throat cutting. There was evidence of broncho-pneumonia and pleurisy in this latter case, so that possibly influenza was the indirect cause of this death.

Dr. Watt found larval forms of *Porocephalus armillatus* (?) in the lungs of a native woman who died of pneumonia.

## VIII.—EXAMINATIONS OF VARIOUS ANIMALS.

367 animals were examined during the year, namely, 2 bats, 3 birds, 1 cat, 81 cattle, 3 dogs, 1 horse, 1 hare, 2 mules, 1 monitor, 261 rats, 1 sheep and 10 snakes.

*Bats.*—Anaplasma were found in the blood of one bat. Nothing was found in the blood of the other, but it harboured round worms in its intestine.

*Birds.*—A sick English fowl, one of several recently imported for the improvement of stock, was brought to the Laboratory for treatment. Its appearance suggested that it was suffering from spirochaetosis. No spirochaetes however were found in the blood, but the leucocytes showed the cell inclusions described by Macfie (*Annals of Trop. Med. & Parasitology*, Vol. VIII, p. 451). It was given injections of Atoxyl and eventually recovered.

The body of a recently dead pigeon was received for examination on the afternoon of the 11th of October whilst the influenza epidemic was rife. A note accompanying the body stated that the sender had watched several pigeons die in the compound of a house in Accra that afternoon between 2 and 4 and that possibly a post-mortem examination of the pigeon might reveal something of interest in connection with the spread of influenza. An examination of the blood drawn from the heart revealed spirochaetes and in all probability the pigeons succumbed to spirochaetosis. The blood of a house martin was not found to contain any parasites.

*Cat.*—A kitten was forwarded to the Laboratory by its owner with the request that it might be given euthanasia as it had become emaciated and suffered from diarrhoea. Nothing was discovered in its blood but its intestines contained several ancylostomes. These appeared to be *a. caninum*.

*Cattle.*—On the 6th of February a blood film from a moribund ox was received from the Superintending Sanitary Inspector who stated that he suspected the presence of anthrax in a herd of cattle awaiting slaughter and consumption in Accra. As the blood film showed bacilli resembling *b. anthracis* morphologically and tinctorially a small quantity of blood was drawn off the ox and injected into a guinea pig. The guinea pig died within 36 hours of the injection and smears made from the lungs, spleen, kidney and heart blood were crowded with *b. anthracis*. After this, blood smears from cattle were forwarded at intervals by the Sanitary Department; in all 81 were examined during the year. In 12 of these smears Gram positive bacilli resembling *b. anthracis* were found; in 39 trypanosomes were observed (*t. virax* in 36, *t. pccaudi* in 2 and *t. congolense* in 6); in two smears *babesia mutans* (?) was seen.

*Dogs.*—Three dogs were examined. In the blood of one *b. canis* was detected in large numbers and "hook" worm ova were found in its faeces. This animal received one injection of trypanblau but died without showing any improvement. In the intestines of two other dogs, ancylostomes were found. *A. ceylonicum* was the parasite in both cases.

Nothing was seen in films made from the blood of two mules and one horse, and the blood of a young "bush" hare revealed no parasites, but showed anaplasmata.

*Monitor.*—Haemogregarines were seen in blood films from a monitor, *Varanus* sp (?). The stomach of this animal contained 63 round worms with their heads buried firmly in the stomach wall. Several of these worms became detached upon dropping the stomach into 5% formaline and from an examination of these specimens cleared in creosote it was concluded that they were probably *Tanqua tiara*, von Linstow, or a closely allied species (the only literature available in Accra being a short account in the 3rd Report of the Wellcome Research Laboratories, p. 189, by Leiper). The head presented transversely grooved cuticular shields protecting the mouth, which appeared to be bilabiate with the labial papillæ arranged in trifoliate manner. Four cervical glands were visible surrounding the anterior end of the oesophagus.

*Rats.*—261 rats were examined during the year. Of these 160 were *cricetomys gambianus*, water, 70 were *mus rattus*, 24 were *mus decumanus*, 5 were *mus alexandrinus* and 1 was the brindled wild rat, *mus barbarus* (?). In the small number of intestines opened parasites similar to those mentioned in the Laboratory Report for 1917 were found in *c. gambianus*, *mus rattus* and *mus decumanus*. Blood films from 144 *c. gambianus* were examined, Grahamella bodies were seen in 53 of these films, anaplasma-like bodies in 71. These were probably basophilic granules, as they showed a bluer tint than the Grahamella bodies when stained with Leishman's stain. No trypanosomes were seen.

Blood films from 48 *mus rattus* were examined; Grahamella bodies were discovered in 2, basophilic granules in 9 and trypanosomes (*t. lewisi*) in 14.

Blood films from 23 *mus decumanus* were examined, Grahamella bodies being found once, basophilic granules three times and trypanosomes (*t. lewisi*) four times.

A considerable number of ectoparasites from these three rats were collected, consisting of fleas, ticks, mites and cockroaches. This collection has been forwarded to the Imperial Bureau of Entomology for identification of species.

4,565 fleas were taken off 146 *c. gambianus*, 94 fleas were taken off 50 *mus rattus*, and 32 fleas off 23 *mus decumanus*. Graham (Report on Plague in the Gold Coast in 1908, W. J. Simpson, p. 25) implies that one reason for the scarcity of ectoparasites in the case of *mus decumanus* as compared with *c. gambianus* is the fact that *c. gambianus* is a bulkier animal and cools more slowly when dead than *mus decumanus* and is therefore less early deserted by its parasites. This may apply to animals which have been dead some time but can have no bearing on animals brought in alive and killed by chloroform.

The fact that *t. lewisi* was not once seen in 144 blood films made from *c. gambianus* while it was found in 14 blood films of 48 made from *mus rattus* and in 4 of 23 made from *mus decumanus* seems to indicate that *c. gambianus* is not naturally susceptible to infection with *t. lewisi*, especially when the flea index of *c. gambianus* is taken into consideration in comparison with those of *mus rattus* and *mus decumanus*.

I wish to express my indebtedness to the Laboratory Assistant, Mr. P. C. Paitoo, Junr., for much assistance in the making and examination of blood films and in the collection of ectoparasites from these rats.

*Sheep.*—Nothing of pathological interest was discovered in the single sheep examined.

*Snakes.*—An examination of 10 snakes was made. In six nothing of interest was found. One specimen had nematodes in its intestine, three showed in their red corpuscles those peculiar bodies described as Toddia by Franca (Archiv do Instit. Bacter Camara Pestana, tome III., fasc II.), and in addition one of the three exhibited haemogregarines in its corpuscles.

TABLE V.—EXAMINATION OF MOSQUITO LARVÆ, 1918.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total.
Number of samples of larvae received ... ...	48	46	84	78	90	71	64	20	27	30	63	41	662
<i>S. fasciata</i> (F.) ... ...	occurred in 521 of the samples	78·70 per cent.											
<i>C. fatigans</i> (Wied) ... ...	116 „ „ „	17·52 „ „											
<i>A. costalis</i> (Loew) ... ...	37 „ „ „	5·60 „ „											
<i>C. decens</i> (Theo) ... ...	18 „ „ „	2·71 „ „											
<i>C. invidiosus</i> (Theo) ... ...	18 „ „ „	2·71 „ „											
<i>C. thalassius</i> (Theo) ... ...	9 „ „ „	1·35 „ „											
<i>C. duttoni</i> (Theo) ... ...	5 „ „ „	0·75 „ „											
<i>Stegomyia luteocephala</i> (Newst) ...	3 „ „ „	0·45 „ „											
<i>Stegomyia metallica</i> (Edw.) ...	3 „ „ „	0·45 „ „											
<i>C. quasigelidus</i> (Theo) ...	1 „ „ „	... ...											
<i>C. tigripes var. fusca</i> (Theo) ...	1 „ „ „	... ...											
<i>Culicomyia nebulosa</i> (Theo) ...	1 „ „ „	... ...											
<i>Muedius scatophagooides</i> (Theo) ...	1 „ „ „	... ...											
<i>Ochlerotatus albocephalus</i> (Theo) ...	1 „ „ „	0·15 „ „											
<i>Ochlerotatus minutus</i> (Theo) ...	1 „ „ „	... ...											
<i>Stegomyia apicoargentea</i> (Theo) ...	1 „ „ „	... ...											
<i>Stegomyia unilineata</i> (Theo) ...	1 „ „ „	... ...											

## IX.—EXAMINATION OF MOSQUITO LARVÆ.

637 samples of mosquito larvae was forwarded to the Laboratory for examination during the year through the courtesy of the Medical Officers of Health, Dr. J. B. Alexander and Dr. M. B. Hay; 25 samples were also examined collected from various sources in Accra other than those which usually come under the observation of the native Sanitary Inspector. *Stegomyia fasciata* (F.) was found in 521 of the total samples (78·7 per cent.), *c. fatigans* (Wied) occurred in 116 (17·5 per cent.), *a. costalis* (Loew) appeared in 37 (5·6 per cent.), *c. decens* (Theo) and *c. invidiosus* (Theo) each occurred 18 times (2·7 per cent.), *c. thalassius* (Theo) was found on 9 occasions (1·3 per cent.), and *c. duttoni* (Theo) on 5 (0·7 per cent.), *stegomyia luteocephala* (Newst) and *stegomyia metallica* (Edw) were discovered 3 times (0·45 per cent.), and the following mosquitoes were each found on a single occasion (0·15 per cent.), *c. quasigelidus* (Theo), *c. tigripes var. fusca* (Theo), *euliciomyia nebulosa* (Theo), *muedius scatophagooides* (Theo), *ochlerotatus albocephalus* (Theo) *ochlerotatus caliginosus* (Graham), (?) *stegomyia unilineata* (Theo) and *stegomyia apicoargentea* (Theo).

*S. apicoargentea* is recorded for the first time from Accra and if the identification of a damaged specimen by the Imperial Bureau of Entomology be correct *o. caliginosus* (Graham) is also a new species. Fifty-nine species of mosquitoes are recorded from Accra up to date.

Opportunity was taken during the course of a recent tour with the Honourable Principal Medical Officer in the Northern Territories to ascertain the prevailing mosquitoes—so far as it was possible with the time spent at the majority of stopping places limited to less than twenty-four hours—in the native huts and in the Rest Houses for Europeans. As the method adopted mainly consisted in the breeding out of adult mosquitoes from larvæ or pupæ found in various collections of water met with in native compounds, the results obtained are no more representative of the actual mosquito which enter huts in search of blood than are those obtained by the breeding out of mosquitoes from the samples sent to the Laboratory by the Sanitary Department representative of the house frequenting mosquitoes of Accra.

As records of those mosquitoes which breed in domestic utensils and vessels containing water in the vicinity of human dwellings, however, these results are comparable with the results got by breeding out from the samples furnished by the sanitary inspectors in Accra, although the methods of collection are not strictly analogous. The comparison brings out some points of interest. In Accra during the past two years 1,121 samples of mosquitoes have been examined; *s. fasciata* was found in 876 (78 per cent.), *c. fatigans* Wied, in 221 (19·7 per cent.), *a. costalis*, Loew, in 43 (3 per cent.), *c. decens*, Theo, in 20 (1·7 per cent.), *c. invidiosus*, Theo, in 18 (1·6 per cent.), *c. duttoni*, Theo, in 5 (0·4 per cent.) *c. tigripes var. fusca*, Theo, in 3 (0·2 per cent.) and *Culicomyia nebulosa*, Theo, in 1 (0·08 per cent.).

The compounds of 44 villages and towns in the Northern Territories were visited and samples of mosquito larvæ were obtained from 42. In 34 of the villages and towns *s. fasciata* F. was found (77 per cent.), in 35 *c. duttoni*, Theo (79 per cent.), in 23 *c. decens*,

Theo (52 per cent.), in 21 *c. tigripes* (*var fusca* Theo ?) (47 per cent.), in 21 *culiciomyia nebulosa*, Theo (47 per cent.), in 20 *Stegomyia sugens*, Wied (45 per cent.), in 4 *a. costalis*, Loew (9 per cent.), and in 3 *c. invidiosus*, Theo (6.8 per cent.).

It will be noticed that with the exception of *c. fatigans* and *s. sugens* the species in Accra and in the towns and villages of the Northern Territories are alike. *C. fatigans* has yet to be recorded from the Northern Territories and *s. sugens* from Accra.

A wrong impression is apt to be given by the figures quoted above. Although *s. fasciata* was found in 77 per cent. of the villages and towns visited it is to be remembered that it was specially looked for in order to determine its distribution in the Northern Territories and that in many instances it was not found without careful and prolonged search. It is a much rarer mosquito in the Northern Territories than in the coast towns. What bearing on disease and its transference in the Northern Territories as compared with coast towns the increase in proportional representation of the other culicine larvæ breeding in domestic utensils has, it is impossible to state.

Filariasis is said by Medical Officers who have been stationed on the northern boundary of the Northern Territories to be common, and disease usually associated with *f. bancrofti* such as elephantiasis, lymph serotum and varicose groin glands to be much more common than in the Colony proper. If this be really the case the role played by *c. fatigans* must be taken up by some other mosquito or mosquitoes. *A. costalis*, *mansonoides uniformis* and *s. fasciata* are known to be potential carriers and *c. duttoni* "was found to be one of the hosts of *filaria nocturna* by Dr. Dutton" (Theobald "Report on a collection of Mosquitoes from Gambia, and descriptions of new species" Appendix to Memoir X, Liverpool School of Tropical Medicine p. VI.).

*Teniorhynchus aurites*, Theo, was taken by Mr. Course at Weshiang in November and *Anopheles pretoriensis*, Theo, was bred out from larvæ collected from some shallow rock pools at Winduri, Northern Territories, in June. Both these mosquitoes are new to the Gold Coast.

#### X.—BACTERIOLOGICAL EXAMINATION OF WATER.

Between the last week of March and the close of the year a considerable amount of work was done in the bacteriological examination of samples of water in connection with the purification of the Accra water supply by the excess lime method of Houston.

In order to test the process before employing it on a large scale a preliminary experimental plant was erected at the water works. This consisted of two tanks of 3,000 gallons capacity, each tank being about 8 feet in depth and uncovered so as to expose the contents to the action of the air and sunlight. Both tanks were filled to a depth of 7 feet 6 inches with water taken from the River Densu. To the water in one tank lime was added in excess, while the water in the other tank, being untreated, acted as a control. The excess lime varied between 9 and 1.9 parts per 100,000 at the times of sampling. Three samples were usually drawn off each tank, at a depth of one foot from the surface, at a depth of one foot from the bottom and at the mean point between these two. It was hoped that something might be learned with regard to the bactericidal action of sunlight by the examination of samples taken at different depths of the control tank. It has to be admitted that the differences in the results obtained from the examination of the samples from different levels were so slight and the experiments so few as to permit of no definite conclusion being drawn though there were indications that the lactose fermenters disappeared more quickly at the top than at the middle or bottom of the tank. However, if nothing definite was gained in this direction the examination of the three samples from each tank ensured a more thorough investigation of the water.

Eight experiments were carried out, samples being sent in to the Laboratory after various periods of lime treatment as shown in the accompanying table. Before analysis the excess alkali as specified by the Chemist in each sample from the limed tank was neutralised by  $\text{N}_2\text{HCL}$ .

In all the experiments except one *b. coli* was found to be absent in 50cc. of sample, the largest quantity tested, after 24 hours treatment with lime; in fact it was absent from 50cc. in the majority of samples tested at the end of six hours treatment. In the samples drawn from the control tank after 24 hours storage *b. coli* was invariably present in 0.01cc., the smallest quantity tested. It will be seen, however, that storage, even for so short a period as six hours (Experiment 2) tended to reduce *b. coli*. Algae appeared in the water of the control tanks but not in that which had been limed.

The preliminary trials proving satisfactory, an experiment was tried with excess lime on the ordinary working scale with a view to determining the rate of neutralisation of the excess alkali in such conditions. Low Level Reservoir No. 1 was filled with river water and excess lime added, an excess of 6 parts per 100,000 being aimed at. The filling of the reservoir was completed on the 6th May and the water was found to be free from alkali on the, 10th June. Samples received on the 15th May showed no *b. coli* in 50cc., the largest amount tested.

*B. coli* was found in 50cc. of a sample taken from this reservoir on the 18th June. It was not, however, present in 50cc. of the same water after passing the filters.

The water from Low Level Reservoir No. 1 having become exhausted in August, this reservoir was again used for test purposes. It was filled with limed water between the 9th and 16th September, the amount of excess lime aimed at in this case being 4 parts per 100,000.

Neutralisation point was reached on the 1st October. Samples of water from the reservoir and of the same water after passing the filters received on the 1st November contained no *b. coli* in 50cc., the largest amount tested.

Some tests were made with alum, which showed, as was expected, that it had but little power in reducing *b. coli*.

Water direct from the River Densu was examined on the 20th November. *B. coli* was found in .0001cc.

At the request of the Senior Sanitary Officer, weekly examinations were made of samples of water taken from various standpipes in Accra and of samples of water after it had passed the filters at Weschiang. In taking the samples from the standpipes no precautions were taken beforehand, such as running the water to waste for some minutes or flaming the tap, as it was desired to procure a sample such as the average individual obtains from these pipes. It was found that while no *b. coli* was found in 50cc., the largest quantity tested, of the water obtained from the final filters, it was distributed in a capricious way in the water obtained from the standpipes. Houston's modified 'Flaginac' method was employed in testing for *b. coli*. Five different quantities of water, .01cc., .1cc., 1cc., 10cc. and 50cc. were added to tubes of MacConkey's neutral red bile salt glucose peptone water "Rebipegluqua." These tubes were incubated for 48 hours and occasionally for longer periods. From the tube showing acid and gas formation to which the smallest quantity of sample had been added cultures were planted on MacConkey's neutral red bile salt lactose agar "Rebipelagar" and incubated for 24 hours. Subcultures from red colonies on the "Rebipelagar" were made in lactose peptone water, in saccharose peptone water and in ordinary peptone water. These were incubated for 24-48 hours, when the peptone water was tested for indol and hanging drops examined for motility. The laboratory being without adonite and inulin and only receiving a supply of dulcite towards the end of November, it was not possible to make any attempt at differentiating the organisms found.

Of 65 cultures which produced acid and gas in "Rebipegluqua" and colonies on "Rebipelagar", 7 fermented neither lactose nor saccharose, 35 fermented both, 9 fermented lactose alone and 14 saccharose alone. 5 showed no motility and 24 did not seem to produce indol.

The number of fermenters of both lactose and saccharose is interesting in view of Houston's remarks. "The typical *b. coli* of the human intestinal tract may be divided into two classes according to their action on saccharose. The majority do not ferment this sugar or act on it only to a slight extent. Hence typical *b. coli* which do not ferment saccharose would seem to be more significant of undesirable pollution than those which do ferment it."

The high percentage of cultures in which indol was not found is probably due to the facts that the incubation of the peptone water tube was not sufficiently prolonged, and the test used was Salkowski's without heating.

One chemical analysis of water was made at the laboratory during the year and a bacteriological analysis of samples of water was done on three occasions, necessitating the making of 807 cultures.

## BACTERIOLOGICAL EXAMINATION OF WATER.

Date.	No.	Source.	<i>B. coli.</i>					Remarks.
			.01 cc.	.1 cc.	1 cc.	10 cc.	50 cc.	
21.1.18	1	Tap in Laboratory compound (un-flamed).					+	
	2	Tap in Laboratory compound (flamed).					+	
27.3.18	3	River (Densu) water.	+	+	+	+	+	
28.3.18 I.	4	Water from experimental tank after 24 hours treatment with lime.	-	-	-	-	-	Top. Middle. Bottom.
	5	Water from experimental tank after 24 hours storage, no lime treatment.	+	+	+	+	+	Top. Middle. Bottom.
	6	Water from experimental tank after 7 days treatment with lime.	-	-	-	-	-	Top. Middle. Bottom.
3.4.18 I.	7	Water from experimental tank after 7 days storage, no lime treatment.	-	-	+	+	+	Top. Middle. Bottom.
	8	Water from experimental tank after 6 hours treatment with lime.	-	-	-	-	-	Top. Middle. Bottom.
	9	Water from experimental tank after 6 hours storage, no lime treatment.	+	+	+	+	+	Top. Middle. Bottom.
II.	10	Water from experimental tank after 12 hours treatment with lime.	-	-	-	-	-	Top. Middle. Bottom.
	11	Water from experimental tank after 12 hours storage, no lime treatment.	-	+	+	+	+	Top. Middle. Bottom.
	12	Water from experimental tank after 6 hours treatment with lime.	-	-	-	-	-	Top. Middle. Bottom.
III.	13	Water from experimental tank after 6 hours storage, no lime treatment.	+	+	+	+	+	Top. Middle. Bottom.
	14	Water from experimental tank after 6 hours treatment with lime.	-	-	-	-	-	Top. Middle. Bottom.
			-	-	-	-	-	

Date.	No.	Source.	<i>B. coli.</i>					Remarks.
			.01 cc.	.1 cc.	1 cc.	10 cc.	50 cc.	
10.5.18 IV.	15	Water from experimental tank after 6 hours storage, no lime treatment.	-	+	+	+	+	-Top. Middle. Bottom.
15.5.18	16	Water from low level reservoir No. 1 after lime treatment.	-	-	-	-	-	
17.5.18 IV.	17	Water from experimental tank after 7 days treatment with lime.	-	-	-	-	-	-Top. Middle. Bottom.
IV.	18	Water from experimental tank after 7 days storage, no lime treatment.	-	-	+	+	+	-Top. Middle. Bottom.
4.6.18 V.	19	Water from experimental tank after 6 hours lime treatment.	-	-	-	-	+	-Top. Middle. Bottom.
V.	20	Water from experimental tank after 6 hours storage, no lime treatment.	+	+	+	+	+	-Top. Middle. Bottom.
5.6.18 V.	21	Water from experimental tank after 24 hours treatment with lime.	-	-	-	-	-	-Top. Middle. Bottom.
V.	22	Water from experimental tank after 24 hours storage, no lime treatment.	+	+	+	+	+	-Top. Middle. Bottom.
12.6.18 VI.	23	Water from experimental tank after 6 hours treatment with lime.	-	-	-	-	-	-Top. Bottom.
VI.	24	Water from experimental tank after 6 hours storage.	+	+	+	+	+	-Top. Bottom.
13.6.18	25	Water drawn off a hydrant in Accra.	-	-	-	-	-	
13.6.18 VI.	26	Water from experimental tank after 24 hours treatment with lime.	-	-	-	-	-	-Top. Bottom.
	27	Water from experimental tank after 24 hours storage, no lime treatment.	+	+	+	+	+	-Top. Bottom.
18.6.18	28	Water from final filter after treatment of water in low level reservoir No. 1 with lime. No excess lime present.	-	-	-	-	-	
	29	Low level reservoir No. 1 after lime treatment.	-	-	-	-	+	

Date.	No.	Source.	<i>B. coli.</i>					Remarks.
			.01 cc.	.1 cc.	1 cc.	10 cc.	50 cc.	
21.6.18 VI.	30	Water from experimental tank after 9 days treatment with lime.	-	-	-	-	-	Top. Bottom.
VI.	31	Water from experimental tank after 9 days storage, no lime treatment.	-	+	+	+	+	Top. Bottom.
18.7.18 VII.	32	Water from experimental tank after 6 hours treatment with lime.	-	-	-	-	-	Top. Bottom.
18.7.18 VII.	33	Water from experimental tank after 6 hours storage. No lime treatment.	+	+	+	+	+	Top. Bottom.
19.7.18 VII.	34	Water from experimental tank after 24 hours treatment with lime.	-	-	-	-	-	Top. Bottom.
VII.	35	Water from experimental tank after 24 hours storage. No lime treatment.	-	+	+	+	+	Top. Bottom.
1.8.18	36	Sample of water after addition of alum no excess lime, no filtration.	-	-	-	+	+	
	37	Sample of water untreated as control.	-	-	+	+	+	
	38	Sample of water after addition of alum. No excess lime, but filtered.	-	-	+	+	+	
	39	Sample of water after addition of alum and 24 hours after the addition of alum lime added in excess.	-	-	-	-	-	Lime excess $= 0.45 \frac{N}{2} HCl$ per 100 cc.
8.8.18 VIII.	40	Water from experimental tank after 6 hours treatment with lime.	-	-	-	-	-	Top. Bottom.
VIII.	41	Water from experimental tank after 6 hours storage. No lime treatment.	-	+	+	+	+	Top. Bottom.
9.8.18 VIII.	42	Water from experimental tank after 24 hours treatment with lime.	-	-	-	-	-	Top. Bottom.
VIII.	43	Water from experimental tank after 24 hours storage. No excess lime.	-	-	+	+	+	Top. Bottom.

Date	No.	Source.	<i>B. coli.</i>					Remarks.
			.01cc.	.1cc.	1cc.	10cc.	50cc.	
13.8.18	44	Water from low level reservoir No. 1.	-	-	+	+	+	End of large scale experiment, no excess lime present.
	45	Water from low level reservoir No. 2.	-	-	-	+	+	
22.8.18	46	Final filter No. 1 ... ... ...	-	-	-	-	-	-
1.11.18	47	Water from low level reservoir No. 1.	-	-	-	-	-	Treated with lime 4 parts per 100,000 and stored. Neutral point reached 21.10.18.
	48	Same water as No. 47, after passing filter: final filter No. 2.	-	-	-	-	-	
11.11.18	49	Sample of water taken from standpipe in the Laboratory compound.	-	-	-	+	-	-
20.11.18	50	Sample from tap in the power house at Weshiang.	-	-	-	-	-	
	51	Service reservoir sample ...	-	-	-	-	-	
28.11.18	52	Standpipe beside C. F. A. O. Lutterodt Street.	-	-	-	+	+	
	53	Fountain in market place ...	-	-	-	+	+	
5.12.18	54	Standpipe at junction of Rowe Road with Tudu Road	-	-	-	-	-	
	55	Standpipe at junction of Bannerman Road with High Street.	-	-	-	-	-	
12.12.18	56	Standpipe near P.M.'s courthouse	-	-	-	-	-	
	57	Standpipe in Town Council Office yard.	-	-	-	-	-	
19.12.18	58	Final filter No. 1 ... ... ...	-	-	-	-	-	
	59	Standpipe near Mosque, Accra ...	-	-	+	+	-	
			.00001 cc.	.0001 cc.	.001 cc.	.01 cc.	.1 cc.	
20.11.18	60	Water from River Densu at pump house, Weshiang.	-	+	+	+	+	+

## INFLUENZA.

Influenza appeared at Accra during the first week in September and had assumed epidemic proportions by the middle of the month. The Acting Pathologist was put in charge of the extemporised Influenza Hospital in which some 240 cases of a more or less severe nature were treated, and about 300 cases of a milder type came under his notice as Medical Officer in charge of Cantonments. Amongst the hospital cases the mortality was 12·5 per cent.

The majority of patients seen in the early stages of the disease complained of headache, of pains in the back and limbs, of sore throat and of pain in the line of the trachea. These patients showed injected conjunctivæ, had slight coughs with scanty expectoration and their temperature was usually between 100°–102° F. The hospital cases on the other hand, having been sick for several days previous to admission, had generally higher temperatures, 103°–105° F. with severe coughs accompanied by abundant frothy muco-purulent expectoration which later became thicker, more purulent and of a greenish tinge. Bradycardia was common at this stage and rhonchi with coarse bubbling râles were audible all over the back and front of the chest on auscultation.

The temperature charts showed many irregularities, the temperature often dropping nearly to normal line and then rising again. The temperature of those cases which developed lobar pneumonia and eventually recovered almost without exception came down by lysis. Albuminuria was quite a common symptom, and examination of the deposit after centrifuging the urine showed granular casts.

The commonest complication was broncho-pneumonia, but lobar pneumonia and pleurisy with and without effusion were by no means rare. Occasionally a case which appeared to be progressing favourably developed suddenly distressing dyspnoea and quickly succumbed to heart failure.

The following rarer complications were met with. Parotitis four times, enlarged and inflamed lymphatic glands 3 times, jaundice 3 times, mania (apart from maniacal symptoms occasionally seen in acute cases) twice, middle ear disease twice, orchitis once.

The wives of several of the soldiers miscarried upon being attacked by the disease.

Only a single case of relapse was seen. This patient was discharged from hospital convalescent, his temperature having been normal for four days, but returned within three days of his discharge and went through a second typical attack.

A total leucocyte count was done in five cases in the early stages of the disease and the average number of leucocytes found was 5,500 per cmm.; a differential count made in these same cases showed a relative lymphocytosis. The leucopenia was followed by a leucocytosis with a relative polymorphonuclear increase upon the onset of Pneumonia.

Arneth counts were done in the cases of two Europeans and seven natives. In every case there appeared to be a pronounced "shift to the left," the polymorphonuclears showing nuclei which were undivided or of a horseshoe shaped pattern.

Smears from the sputum of 34 cases were examined microscopically. Pneumococci were found in 29 cases, a gram positive streptococcus in short chains of four or six in eight cases, an intracellular gram negative diplococcus *micrococcus catarrhalis* (?) in eight cases, a small gram negative cocco-bacillus in 12 cases, gram positive cocci in 20 cases, gram negative diplococci in seven cases and gram negative coliform bacilli in 19 cases.

As already reported cultures were made from 26 of the 34 specimens of sputum after washing in sterile normal saline, and a delicate cocco-bacillus which was gram negative was grown on blood agar or "tryagar" in 15.

From one of the sputa a gram negative bacillus resembling *b. pestis* morphologically, though being more rod-shaped than oval, and showing a marked tendency to bipolar staining, was isolated. This bacillus grew readily on blood agar and "tryagar." In the early stages the growth was white but after a week's growth it assumed a semi-translucent appearance with a purple tinge. It grew on ordinary agar, but less luxuriantly. It was motile but feebly so, and was absolutely innocuous to guinea-pigs when rubbed into a shaven patch on the buttock.

In December, 1917, a somewhat similar organism was isolated from a swab made from the throat of a native suffering from naso-pharyngitis. This bacillus was gram negative, showed bipolar staining, was non-motile and innocuous when rubbed into the shaven skin of rats. It grew readily on ascitic agar but with difficulty on ordinary agar. A gram negative bipolar staining bacillus was almost the only organism to be seen in smears made from an abscess cavity in the lung of one of the cases which succumbed to the complications of influenza. Unfortunately pressure of work at the time prevented the making of cultures and the study of the fermentive actions of this bacillus.

McIntosh (*Lancet*, Nov. 23rd, 1918, p. 697) and Harris (*Lancet*, Dec. 28th, 1918, p. 877) have both directed attention to the finding of bacilli resembling *b. pestis* in influenza cases.

Macfie (Accra Laboratory Report for 1914, pp. 21-22) described "a case at first suspected of being plague" in which a non-motile gram negative bacillus, characterised by well-marked polar staining, was isolated from the lungs and glands of the Krooboy whose death was apparently due to acute broncho-pneumonia. Rats inoculated subcutaneously with this bacillus remained well.

As has been previously stated smears were made from the viscera of 11 cases in which the primary cause of death was ascribed to influenza. Pneumococci were found in all, gram positive cocci and streptococci in three cases, a small gram positive cocco-bacillus (possibly *b. pfeifferi*) in two cases and the gram negative bipolar staining organism alluded to above in one case.

Between the time of the outbreak of influenza and the end of the year, autopsies were made upon 18 cases in which death was attributed to complications following influenza.

The lungs and heart were the organs found to be chiefly affected. Pneumonia in one or other form was found in every case, lobar pneumonia occurred in five cases, one case showed a lobar pneumonia of the basal lobe of the left lung which was in a stage of grey hepatization, while broncho-pneumonia patches were visible throughout the right lung. The remaining cases showed broncho-pneumonia usually involving both lungs, in which the pneumonia patches varied greatly in size.

In one lung an abcess cavity the size of a hen's egg was found and multiple small abcesses the size of a haricot bean occurred in another case. The basal lobe of the left lung in a third case appeared to be in a gangrenous condition. On pressure being applied to the lung tissue after section, large quantities of pus could be squeezed from the bronchioles in most cases.

The edges of the lungs were often found to be emphysematous, while other portions were collapsed.

The parietal and visceral pleuræ frequently showed small haemorrhagic patches. Fluid was found in the pleural cavities in seven cases; in three of these it was blood-stained, in one it was bile-stained. No empyema was found. Adhesions between visceral and parietal pleuræ were common and the visceral pleura was often covered with a fibrinous exudation resembling washleather in appearance.

The pericardial sac contained an excess of fluid in four cases; subpericardial and subendocardial petechial haemorrhages were occasionally seen. In several cases on opening the pericardium the serous layer appeared deeply stained with haemoglobin. The heart muscle in many cases was flabby, the right ventricle being usually dilated, while it was rare to find the left ventricle in systole. Vegetations were seen on the mitral valve in one case. Another case had a 'bovine' heart with a dilated aorta and incompetent aortic valves, obviously a lesion of long standing. Yellow clot was generally found in the left auricle. Pericardial adhesions were present in one case. These, however, were probably antecedent to the attack of influenza.

The liver was usually found in a condition of venous engorgement, though occasionally it appeared to be fatty.

One case was examined in which the tissues of the body and the serous exudates were bile-stained. In this case the gall bladder was empty, the mucosæ of stomach and duodenum were congested, the pancreas was intensely congested and of a firmer consistence than normal, but the liver showed nothing except venous congestion. The kidneys were invariably congested. Beyond this except in one case nothing else was found. The case in question possessed of the bovine heart already referred to, was that in which the abcess cavity was found in the lung. The kidneys of this case were large and pale, with adherent capsules, and subsequent examination revealed waxy degeneration.

The spleen was sometimes enlarged and sometimes congested. It never showed any marked pathological change.

The pancreas frequently appeared to be congested and to be harder than in its normal condition.

The brain was examined in a single case. Nothing abnormal was found except a certain amount of congestion.

The bronchial and mesenteric glands were frequently found to be swollen and inflamed.

In December, 1917, a small epidemic diagnosed as plague occurred at Axim. The clinical history of the cases, the heavy mortality and the symptoms manifested, viz., broncho-pneumonia with glandular enlargement, were highly suggestive of plague. The findings at the post-mortem examinations "broncho-pneumonia, petechial haemorrhages on pleuræ, enlarged and haemorrhagic internal lymphatic glands, enlarged and haemorrhagic pancreas" appeared to corroborate the diagnosis, especially when it was stated that bipolar staining bacilli had been found in smears made from the lungs and glands of two of the cases, yet a rat inoculated with material from one of the cases remained free from disease. Unfortunately no cultures were made.

Smears from the viscera and glands of the four cases which ended fatally were forwarded to the Laboratory for examination. Gram negative bipolar staining bacilli were found only in the smears made from the lungs and spleen of one case and as was reported at the time these bacilli were exceedingly scanty and did not show the typical oval form of *b. pestis*. Smears from the lungs of the other case showed pneumococci, gram positive short chained streptococci and gram negative diplococci. No bacilli resembling *b. pestis* either morphologically or in staining reactions were seen in any of the smears made from the lymphatic glands.

In the light of the recent epidemic of influenza considerable doubt arises as to the cause of the outbreak at Axim. Enlarged lymphatic glands are frequently found in cases of influenza, Cole ("Preliminary Report on the Influenza Epidemic at Bramshott" British Medical Journal, Nov. 23rd, 1918, pp. 566-568) states that "the superficial and deep cervical and axillary lymph glands were almost constantly enlarged in severe cases."

Petechial haemorrhages and an enlarged and haemorrhagic appearance of the pancreas such as was associated with plague (Prof. Simpson, "Report on Plague in the Gold Coast in 1908, p 14) occur in cases of influenza and are probably of streptococcal origin. Gram negative bipolar staining bacilli resembling *b. pestis* are also occasionally found in cases of influenza.

(Signed) A. INGRAM,  
M.O.

6th February, 1919.





